Build the StreetFox Recumbent Trike

Another Atomic Zombie™ Extreme Machines Adventure

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About the StreetFox

The StreetFox Recumbent Trike is a fast and comfortable version of the classic "tadpole" style trike (two wheels in the front), which includes rear suspension, three wheel braking, and 26 inch rear wheel for optimal gear range. The StreetFox looks and handles as well as many commercially produced trikes, and can be completely built using commonly available and inexpensive bicycle components and some square tubing. Not one single machined part is needed.

The StreetFox also includes an adjustable bottom bracket so it can fit riders of just about any height from 5 feet to well over 6 feet tall. Due to the rugged construction and use of sturdy 14 mm axle, 48 spoke front wheels, the StreetFox can accommodate riders over 250 pounds. There is plenty of room for customization due to the simple mono boom frame, so you can alter the design to suit your own style or needs.

Figure 1 – A 26 inch suspension frame and rear wheel

The good news is that the entire rear of the trike is an unmodified stock rear triangle from a typical suspension mountain bicycle. As shown in Figure 1, you will need the complete rear triangle, the suspension spring, and at least the part of the main frame that contains the tube that connects the rear triangle to the frame, allowing it to pivot. The front part of the frame is

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not important, so it can be in any shape as long as the rear of the frame is perfectly functional.

Since you can purchase an entire bicycle for not much more than $100, I decided to work with new parts, as this would ensure the suspension, wheel, and brake parts wee all in perfect working order. I ended up using the front half of the mountain bike for an electric project called "The Long Ranger", so every part of the inexpensive department store bike went to good use. If you decide to consult your scrap pile or the local dump for parts, ensure that the rear brakes are working, and that the rim is not damaged in any way.

Figure 2 - A pair of 20 inch BMX wheels

One of the main concerns when designing a tadpole type trike is how to connect the two front wheels to the steering components. The obvious answer would be to simply find a pair of typical 20 inch front wheels then move the threaded hub axle to one side and then bolt it to something strong enough to support it. This answer is partially correct. The problem with this approach is that a typical bicycle hub will not have an axle strong enough for connection on a single side, and your axles would bend as soon as you enter

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the first corner, or before you even make it to the end of your driveway if you weigh more than 180 pounds.

Sure, you could probably build a kid's trike using the largest mountain bike hub axles you can find, but this would still be a risky design, as the first bounce up a curb would certainly bend the axles. Another factor in choosing trike wheels is their lateral strength. Since a trike cannot lean into the corners, the two front wheels are going to be under massive stress around any corner at higher speeds. For this reason, almost all tadpole style trikes use 20 inch or 16 inch front wheels with at least 36 spokes due to their excellent strength.

You may be thinking that this project calls for a pair of expensive rims mounted to a set of custom made hubs, but the good news is that you can purchase a pair of sturdy 20 inch trike wheels from any bicycle shop in the form of 14 mm axle, 48 spoke BMX wheels like the pair shown in Figure 2. Unless you have an unlimited budget, or really know the dynamics of bicycle wheels and plan to make your own hubs, the BMX wheel route is the best way to go. You can expect to pay between $100 and $200 for a pair of suitable wheels complete with smooth tread tires from a bicycle shop.

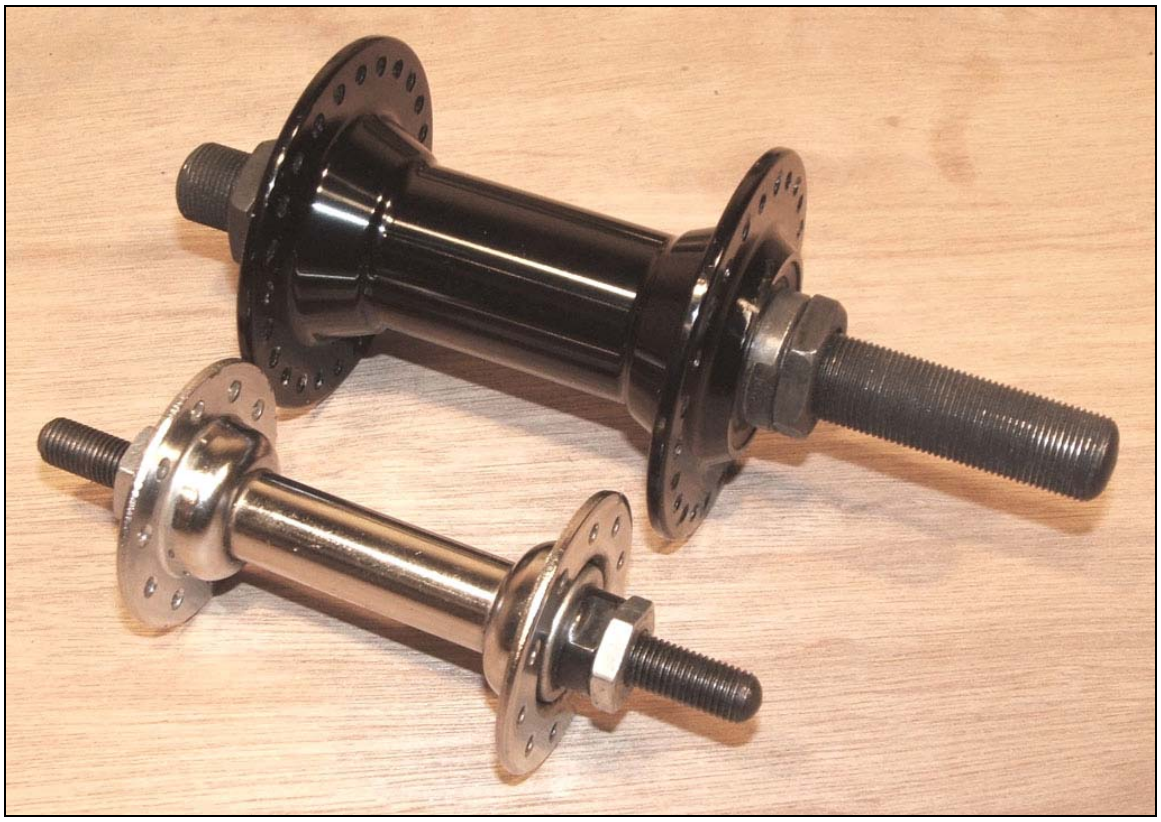

Figure 3 - Hub axles. Yes, size does matter

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As you can see in Figure 3, the difference in axle size between a common bicycle hub and the 14 mm BMX hub is amazing. The 14 mm axle on the BMX hub is made for serious abuse, and if you have ever seen a BMX freestyle competition, then you know what I mean when I say these wheels are indestructible. The smaller axle would be barely enough to hold up a kid's stroller if held by only one side, but the BMX axle would easily survive trike use with a rider at roughly 250 pounds. I have made several trikes using these hubs, and I can assure you, the crazy stunt riding I did went far beyond what most "sane" riders would ever consider doing on a trike! So as a general rule, do not use any threaded axle less than 14 mm in diameter, and do not use a wheel with less than 36 heavy gage spokes. Follow this rule, and you will never bend an axle or "taco" a wheel.

Forks, Crowns and Head Tubes

Figure 4 - Finding two identical head tubes

When you are sourcing steering parts for the front of a tadpole trike, you will basically need two of everything when it comes to the front wheels. As you can see in the completed StreetFox photos, the steering system is made using bicycle components so you do not need any expensive machine shop work done, and the resulting steering system is much smoother than the traditional kingpin bolt style steering system often found on go-carts. Your goal is to find two identical head tubes and the fork hardware to match.

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When I say identical, I am not referring to color or brand, but the overall length and width of the head tube so that both front wheels will be at the same height when the parts are installed. As shown in Figure 4, I have two identical head tubes and two matching fork stems that fit into the head tubes.

All of my parts are from at least three different bicycles, but they are all the same size, and that is all that really matters. If you don't have access to a large bicycle scrap pile, then you could trim a head tube down an inch or two to match the other one, but keep in mind that you will also need to cut the fork threads, and could end up with not enough thread to install the fork hardware by cutting away too much of the threaded tubing. Also, do not worry about the condition or size of the fork legs, as they are not being used. Just make sure that the fork stem is not bent.

Figure 5 - Checking the fork hardware

It doesn't matter if the head tube is from a 1960’s beach cruiser and the forks are from a competition BMX bike as long as the hardware fits together properly and the forks spin around without friction. I ended up using a 20 inch and a 26 inch fork, but again, this doesn't matter, as the fork legs are soon to be cut from the fork stem. As shown in Figure 5, fork hardware consists of two bearing cups, a pair of bearings, and at least two locking nuts. Bearings are inserted into the cups "balls first", and the fork

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stem should spin without friction of the bearings and cups are the correct size. There are at least three different cup sizes, so the wrong bearing will cause friction, making it difficult to spin the fork stem.

Figure 6 – Removing the bearing race

Before you start amputating the fork legs from the fork stem, first tap off the small bearing race (Figure 6) installed just above the fork crown by tapping it with a small hammer. Tap all the way around the ring until it falls off so you can work on the fork legs without risk of damaging the bearing race with our hacksaw or angle grinder.

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Figure 7 - Cutting the fork legs from the stem

How you cut the fork legs from the fork stem is up to you, but do try to avoid cutting into the fork stem when you are doing this job on both forks. I like to cut around the fork leg using a cut-off disc in my grinder, leaving about 1/4 inch as shown in Figure 7. I then finish up the surface grinding with a rough grinder disc and then clean the area with a flap (sanding) disc. Keep the fork legs around for some other project; they make good head rest supports or seat frames.

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Figure 8 – Mark the crowns for trimming

At this point, you have two perfectly clean fork stems as shown in Figure 8. The length of the crown area may not match on both fork stems, but this does not matter since we will be cutting them down to 1 inch to remove the excess crown area. A bit of tape around the crown area will make a good cutting guide, or you can draw a line around the crown using a marker. The cut line should be 1 inch from the top of the crown where the underside of the bearing race would have been sitting.

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Figure 9 – Fork crowns trimmed to 1 inch

Figure 9 shows the two fork stems after cutting each crown down to 1 inch. The bearing races have been reinstalled by tapping them down the same way they were originally removed. Now both fork stems are exactly the same length and have the same amount of crown material. If you look closely at the bottom of the original fork crown piece that you have just cut, then you can see that it has a small bead of weld around its edge (shown in Figure 9). This is because the crown is actually made of two pieces of tubing that fit together, which might be apparent if you look closely at the area that you just cut. You should run a small bead of weld around this area as it was done on the part you just removed on order to secure the two pieces of tubing back together. If you look ahead to Figure 11, you will see that I have done this as shown on the underside of the fork crown.

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Figure 10 – Cleaning up the head tubes

The head tubes can now be cleaned up by grinding away the excess tubing leftover from the original bicycle frame. As shown in Figure 10, a little work with a grinder disc and flap disc will bring the metal tubing back to its original, ready to the weld state. Removing the paint will spare you from the horrific smell that will fill your garage when welding painted bicycle tubing, so it is worth the extra effort. Again, avoid cutting into the head tube metal when cleaning up the area, and take this opportunity to weld up any holes that have been drilled into the head tube where the other tubing was welded. A few passes around the outside of the hole will fill it with weld metal so you can grind the area flush.

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Figure 11 – Reinstalling the fork hardware

Now you can clean all the fork hardware and reassemble the parts as shown in Figure 11. Notice the small bead of weld on the underside of the fork crown where the cut has been made. Now you have two identical parts to make your lightweight and friction free steering system. This steering kingpin system is far superior to the bolt and bushing system, which often has unacceptable play and friction. The bicycle head tube was designed to steer a bicycle wheel in a friction free manner, so it only makes sense to use it to do this job on our trike. The bolt and bushing system is easier and would be less expensive to manufacture, but you don't have to cut corners when it comes to your own quality work.

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Axles and Mounting Tabs

Figure 12 – Cutting the axle mounting tabs

The 14 mm axles will be held to the head tubes by a pair of axle mounting tabs (one for each wheel). Originally, I had made a pair of machined tubes to do this same job, but that increased the cost of building the trike, and my goal was to keep the cost down and not use machined parts, so I came up with this system, which I think is easier to work with. Your goal is to make two 1.75 inch by 1.25 inch tabs with a thickness of 1/2 inch so you can secure the axle to the fork crown. Drawing 1 shows the exact dimensions and drilling for these two tabs.

Since half inch thick plate is hard to come by as well as cut, I decided to make my axle mounting tabs by welding two 1/4 inch parts together to form the required 1/2 inch total thickness. You can use any scrap metal, plate or flat bar to make these tabs, as long as the required dimensions and thickness are met. Figure 12 shows the four pieces I cut from the scrap 1/4 inch plate to make the two 1/2 inch axle mounting tabs.

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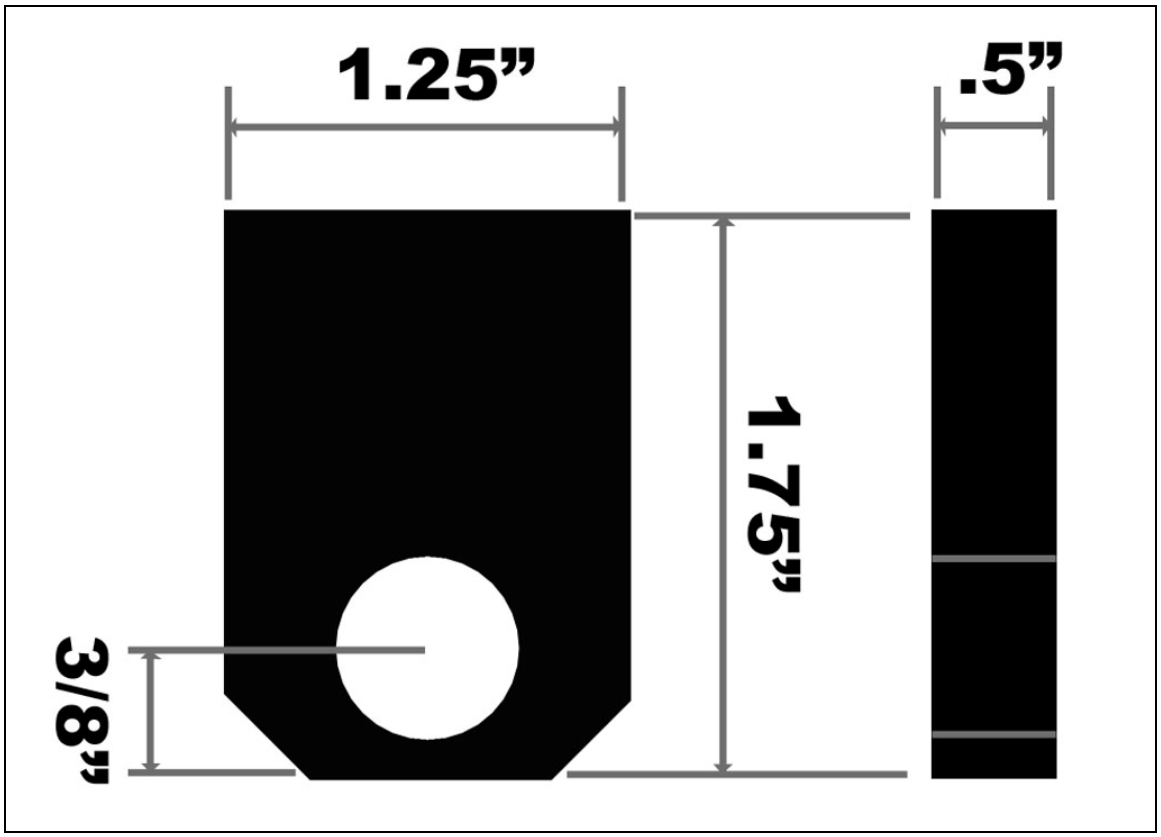

Drawing 1 – The axle mounting tabs

Drawing 1 shows the size and thickness of the axle mounting tabs as well as the drilling for the 14 mm axle hole, which is placed 3/8 inches from the end of the tab. Obviously, a 14 mm drill it is about as common as a comfortable upright bicycle seat, so rather than try to find one, just use a 9/16 drill bit for the 14mm hole. 14mm equals .551 inches, and 9/16 is .563 inches, so the resulting hole will be perfect for the 14 mm axle. If by chance you have a bit of scrap 7/16 inch thick plate, you can make the axle mounting tabs from that, but do not make them any less thick than 7/16 inch. 1/2 inch thickness is your best bet as the weight savings is almost zero.

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Figure 13 – Welding the two ½ plates together

Since I made my axle mounting tabs from 1/4 inch plate, I had to weld two pieces together in order to achieve the required 1/2 inch thick result. As shown in Figure 13, the axle mounting tab on the left has been welded and ground clean and has a pilot hole drilled for the axle hole. The axle mounting tab in the right of the photo is fresh from the vice and has yet to be ground, but you can se that it is nothing more than two bits of 1/4 inch scrap plate welded together to form a 1/2 inch part.

Figure 14 – Drilling the 9/16 or 14mm axle holes

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To drill the 9/16 axle mounting holes, start by drilling a small pilot hole using a 1/8 drill bit and then gradually work your way up to the 9/16 bit. I work my way up the drill bit set, skipping every third bit, so the final hole is exactly where it should be. If you try to go straight for the big drill bit, your holes will probably not be in the same place on each axle mounting tab, or you will jam the bit and end up with the part flying out of the vice. I only own a hand drill, so a drill press is not required, although it would certainly make the job easier. Figure 14 shows the two axle mounting tabs with the 9/16 holes drilled.

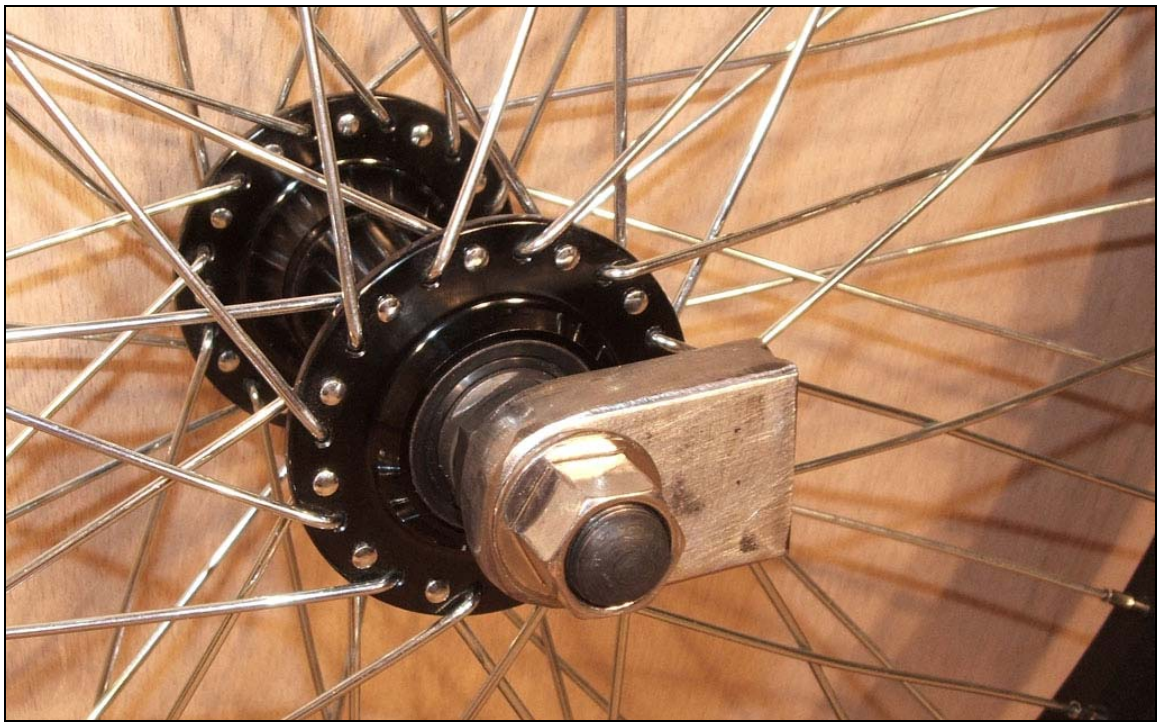

Figure 15 – Test fit the axle mounting tab

With a 9/16 inch hole drilled in the axle mounting tab, it should fit snugly over the 14 mm axle with just enough play to not have to force it on. The tab and the axle should form a 90 degree angle, and there should be plenty of axle length to get the axle nut installed as shown in Figure 15. Another advantage of the axle mounting tab system over the hollow tube mounting method I previously used is that the axle does not need to be taken out and moved to one side of the hub. Not all axles are threaded all the way through, so this became a bit of an issue.

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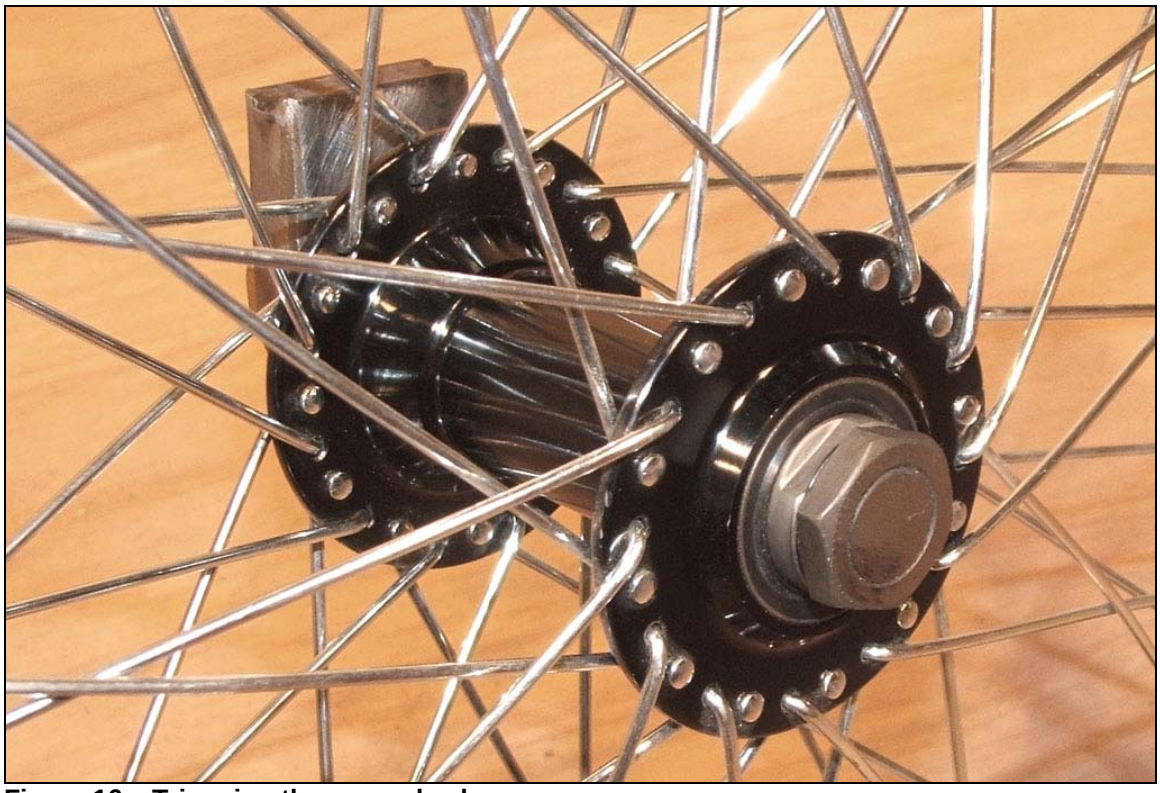

Figure 16 – Trimming the unused axle

The other side of the axle can be cut flush with the locking nut as shown in Figure 16. There is no point having the axle sticking out past the outer side of each front wheel, as this would be a hazard to pedestrians in a close encounter, and also very annoying while trying to move your trike through a narrow doorway. Just use a hacksaw or zip disc and cut the axle flush with the locknut. Now would be a good time to make sure that all of the axle nuts are tightly secured as well. You may also want to paint the bare metal where the axle has been cut, or add a bit of lock-tight just to be safe.

Figure 17 – Mounting the axle tabs to the fork crown

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There are a few angles that we need to get right concerning tadpole trike steering, so take your time and fully understand the next few steps before doing any welding. Nothing here is rocket science, so if you take your time, and fix any obvious errors, the trike will handle like a dream. Shown in Figure 17 is one of the axle mounting tabs tack welded to the base of the fork crown at some weird angle. This angle is no mistake, as it creates what is called "center point steering" so that the wheels turn directly on their axis when touching the road.

This concept is shown in Drawing 2, with the line that travels down the fork stem directly to the center of the tire as it hits the road. Without this center point geometry, the vehicle would swing from side-to-side as you turn the front wheels, causing a dangerous inertia at high speed that could launch you from our seat. Only extremely slow moving vehicles can operate without center point steering, but since it is generally good practice, even lawn tractors and many kid's toys seem to have it. Read ahead a bit so you can understand how this axle mounting tab angle is derived directly from your wheel.

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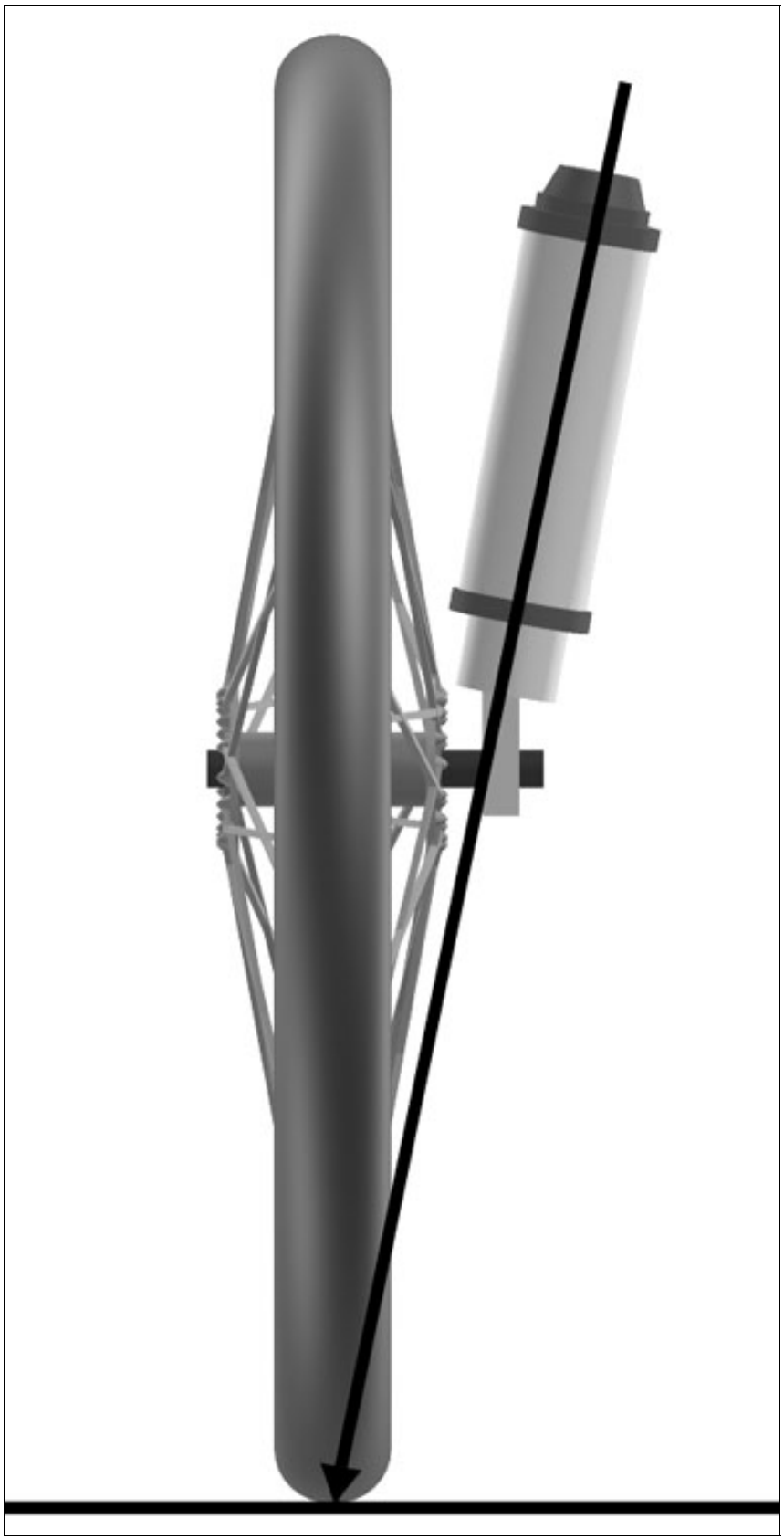

Drawing 2 – Center point steering geometry

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With center point steering, the tire will pivot directly on its center so there is no tire scrub or side to side inertia when making turns at high speed. Drawing 2 shows an imaginary line drawn through the center of the head tube directly to the road under the center of the tire, which is how the angle of the axle mounting tabs is to be calculated.

Figure 18 – Axle tab angle creates center point angle

Figure 18 shows how I derived my axle mounting tab angle. By using a wheel with a fully inflated tire, I initially held the fork stem in place and

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made a mental image of the required angle. The axle mounting tab was then removed from the front wheel and I tack welded it to the fork stem using my "best guess" from the image I had in my mind. Chances are you will get pretty close on your first attempt, but this needs to be checked by bolting the wheel back on the axle mounting tab and then inspecting the angle by drawing that imaginary line through the fork stem to the point of contact under the tire. You can also hold the wheel at 90 degrees to the ground and try turning the fork stem to see if the wheel actually pivots on its center axis.

With a single tack weld holding the axle mounting tab to the fork crown, you can easily force the part into another position if necessary, but don't be afraid to break the tack weld and try again of your center point angle is obviously wrong. I did the tack weld three times to get to the angle shown in Figure 18. You only have to do this guesswork once, as the other side can be made by copying the angle you get on the first side. As you can see, specifying an angle here would be useless, as it totally depends on our tire size, hub width, and even the type of hardware on your axles.

When you have the axle mounting tab tack welded to the fork crown at the correct angle, secure it by welding the tab at both ends. Do not weld the face of the tab (the hole side) until you have rechecked your alignment using the wheel once more.

Figure 19 – Duplicate the angles

Figure 19 shows the two axle mounting tabs securely welded to the fork crows by welding the sides of the joint. I copied the angle from one part to the next, so I would not have to go though all that guesswork again. While laying side-by-side, the fork stems and axle mounting tabs should look

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identical. At this point, you can weld the face of the joint, making sure you do both parts in the same sequence. By welding the joint using the same sequence, you ensure that both front wheels have the same angle.

Figure 20 – Axle mounting tabs fully welded

Figure 20 shows the completed welding all the way around the axle mounting tabs on both parts. Since I used the same amperage setting and sequence to weld both parts, any slight distortions in the axle mounting tab angles have affected each part the same amount. A final test shows that my center point steering angles are almost perfect. Two small holes have also been drilled in the axle mounting plates to lighten them up a bit. Of course, losing a few ounces of weight to drill shavings is not really important, but the parts do look more professional like this.

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Figure 21 – Competed front steering parts

Now that you have two identical wheels mounted to identical steering tubes as shown in Figure 21, much of the hard work is now done. Eventually you will need to mount each head tube to the cross boom at the correct angle, but other than that, the rest of the frame is pretty basic, and we will be working on the easy stuff for a while now.

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The Frame

Figure 22 – The swingarm tube (bottom right)

The only part of the bicycle frame that you need besides the rear swingarm is the small tube that carries the plastic plugs allowing the swingarm to pivot up and down. Not all suspension frames are the same, but you can easily figure out which parts you will need even if they do not look like the one shown in Figure 22. Basically, you will be taking any parts needed to re-fasten the swingarm to the trike frame, so cut them from the original mountain bike frame.

Figure 23 – The main boom tube

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The entire StreetFox frame is made from 1.5 inch mild steel square tubing with a 1/16 inch wall thickness. This tubing can be ordered from most steel suppliers and is very easy to cut and weld. Steel suppliers like to rate tubing wall thickness using a gage number, so 1/16 wall tubing will be called 16 gage tubing, and although there is a slight difference between the two, your best bet is to tell them you want a length of 1.5 inch square tubing with a wall thickness as close to .0625 inch (1/16) as you can get. If you are a heavy rider (over 250 pounds), then you should ask for the next size after that, which will likely be 14 gage tubing, or .078 inch wall tubing. Round tubing should be avoided for this project, as it will yield a very flexible frame which will most likely be out of alignment after all the welding is completed.

The main boom runs from the pivot point of the rear swing arm all the way to the front of the trike. The main boom also carries the seat back, the two cross boom tubes, and also allows the sliding bottom bracket to adjust for just about any leg length. The overall length of the main boom is determined by the size of the tallest rider that will use the StreetFox, so it can be cut down to a maximum length based on rider height rather than having it stick out way past the bottom bracket.

To start, cut a 6 foot length of the square tubing to become your main boom. Yes, 6 feet is more than you will ever need, and you will be cutting it down once the bottom bracket has been set up for your tallest rider. It's better to start with an extra long main boom, than end up an inch too short because you forgot to add the extra few inches added by the seat padding or something similar. If you plan on adding a full fairing to the StreetFox at some later time, the extra long boom may become helpful with supporting the front of the fairing, so consider this as well. Figure 23 shows a section of the 6 foot long 1.5 inch square tube boom that I have just cut.

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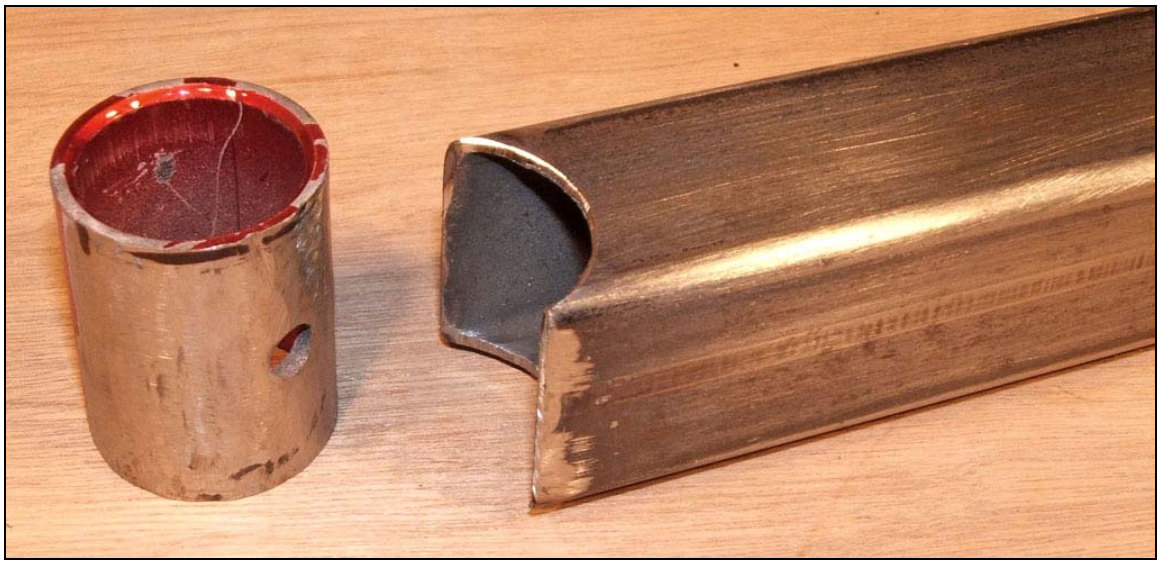

Figure 24 – Installing the swingarm pivot tube

The suspension swing arm pivot tube that was cut form the mountain bike frame needs to be connected to the end of your main boom, so you will have to cut the appropriate "fishmouth" shape at one end of the tube as shown in Figure 24. A good way to do this is to use the pivot tube as a guide to mark the area to be ground, this way you don't take out too much material. The goal here is to make a good joint that will have no gaps once the part is welded in place. Again, your swingarm parts may differ, but the idea is the same. Before welding, tap out the swingarm bearings, as they are most likely just plastic plugs and would melt instantly during the welding process.

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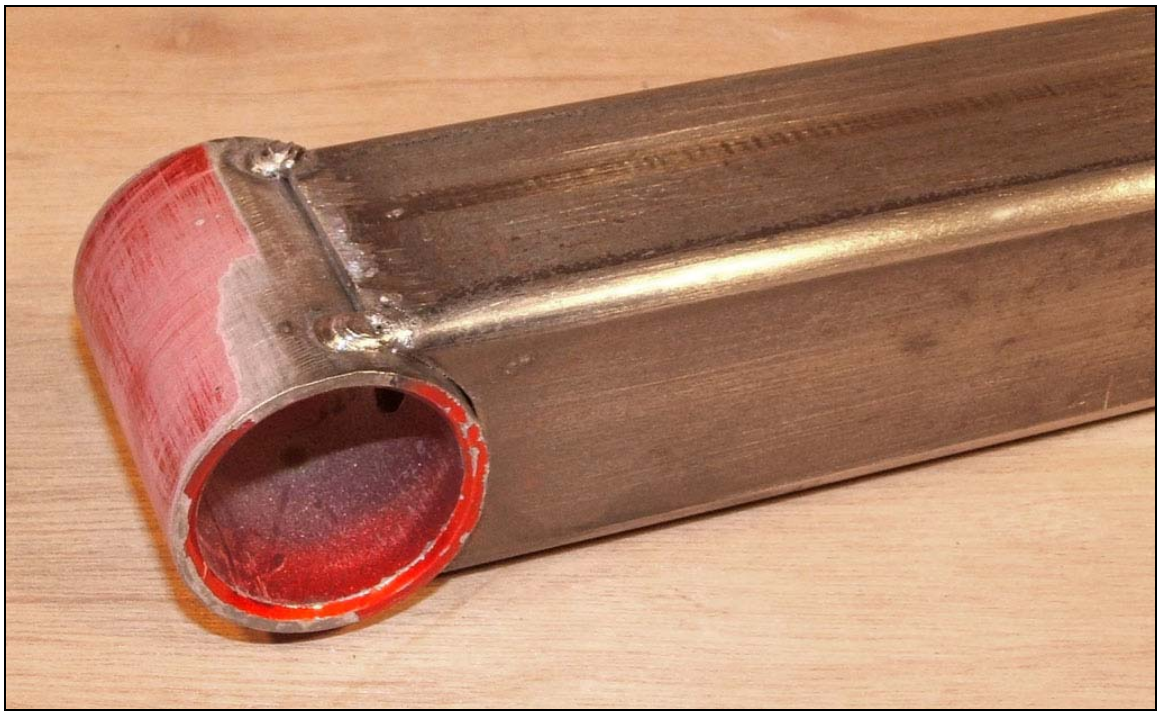

Figure 25 – Swingarm tube tack welded

Figure 25 shows the swingarm pivot tube tack welded to the main boom on all four corners. Once you have the part tack welded and it has been checked for alignment, you can continue welding the joint starting with the top and bottom and then the sides. To ensure that the tube is welded inline with the boom, place a straight edge across one end of the pivot tube and check it against the length of the boom.

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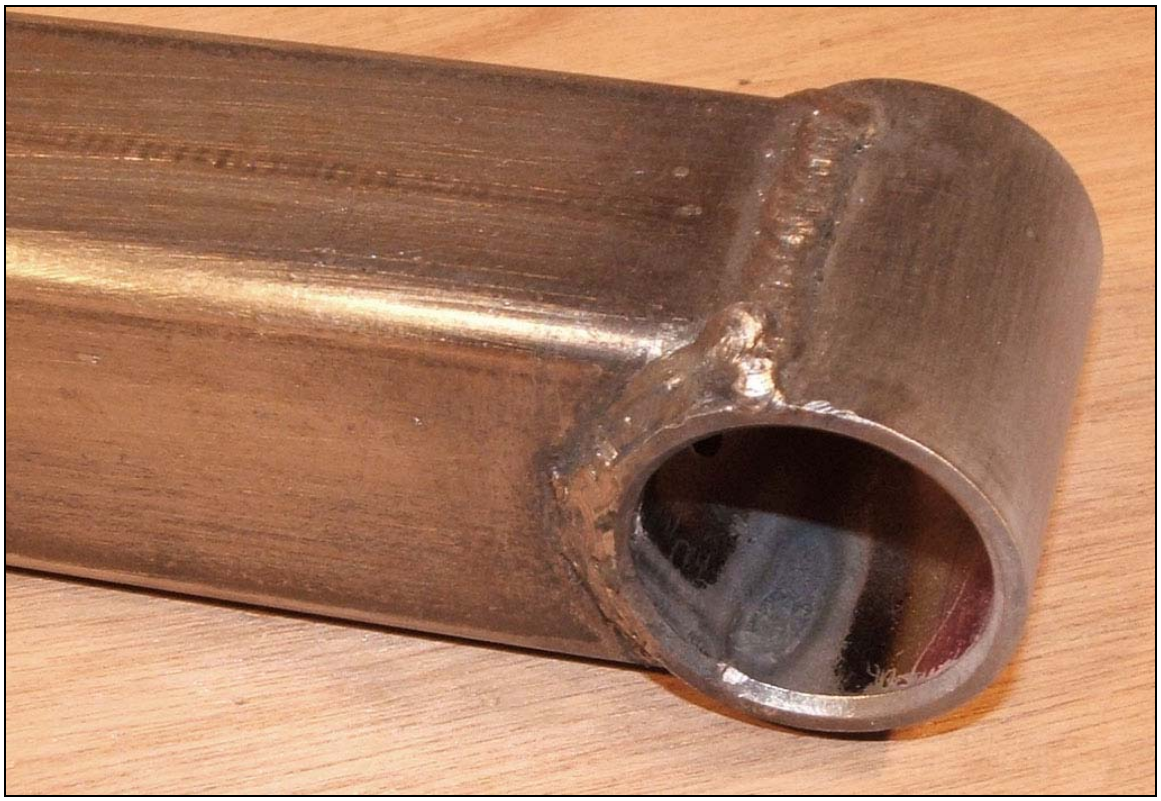

Figure 26 – Swingarm tube fully welded

The entire joint should be welded as shown in Figure 26. Once the parts have cooled, you can tap the plastic bearings back into the pivot tube and then bolt the rear suspension triangle onto the main boom. The pivot tube may have been warped slightly due to heat distortion, so it may take a bit of effort to get the bearings to fit back into the tube. If distortion is extreme, you may need to work the tube back into shape using a large hammer - you know the routine!

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Figure 27 – Rear triangle installed

The rear triangle is bolted onto the pivot tube, completing a large chunk of the building process. As shown in Figure 27, the installed rear triangle can pivot up and down freely, and it should be inline with the rest of the boom when viewed along the length of the main boom. Currently, there is nothing to connect the suspension spring to, but that is going to change in the next few steps.

Seat Tube

Figure 28 – Cutting the seat tube

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The seat tube is a 14 inch long piece of 1.5 inch square tubing that will serve the function of connecting the suspension spring as well as becoming a support for the rear of your seat. This tube is cut to a total length of 14 inches, and then one end is cut off at 45 degrees as shown in Figure 28. Forty-five degrees is a comfortable seat angle, but if you have other plans and understand how this angle will affect the rest of the frame, then feel free to alter the seat angle to suit your needs.

A more upright position will place your head up higher, but could become uncomfortable if increased too much, making it difficult to pedal or even reach the handlebars. On the other extreme, a much laid back seat will make the trike feel more like a lowracer, making it difficult to see properly in traffic or even over your own feet.

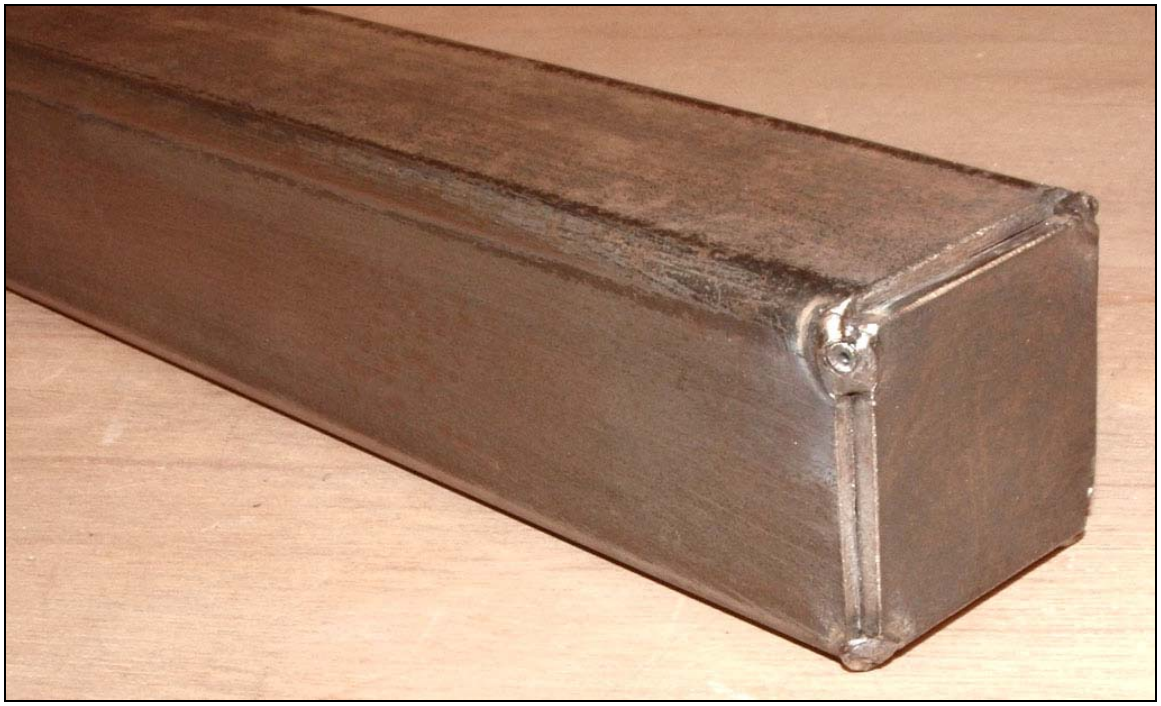

Figure 29 – Capping the open end of the tube

The top of the seat tube is cut off at 90 degrees and needs to be capped off to keep out moisture and anything else that may want to crawl inside. It is a rule of mine to never leave an open ended tube as this looks totally unprofessional, allows moisture into the frame, and could be a hazard due to the sharp edges of the tube. A simple cap can be made by cutting out a 1.5 inch square section of some scrap tubing as shown in Figure 29. The cap is simply welded along the seams using only enough heat to fill the joint with weld metal.

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Figure 30 – Tubing end cap completed

After welding the cap to the open end of the tube, use a flap disc or sanding disc to clean up the joint so the tube will look like it never had an open end. Figure 30 shows the caped seat tube after a few minutes of joint cleanup. These little details add up to take your final product out of the home built zone into the professional looking zone. It feels much better to be asked "how much did that cool trike cost?" rather than "how long did it take to build that?"

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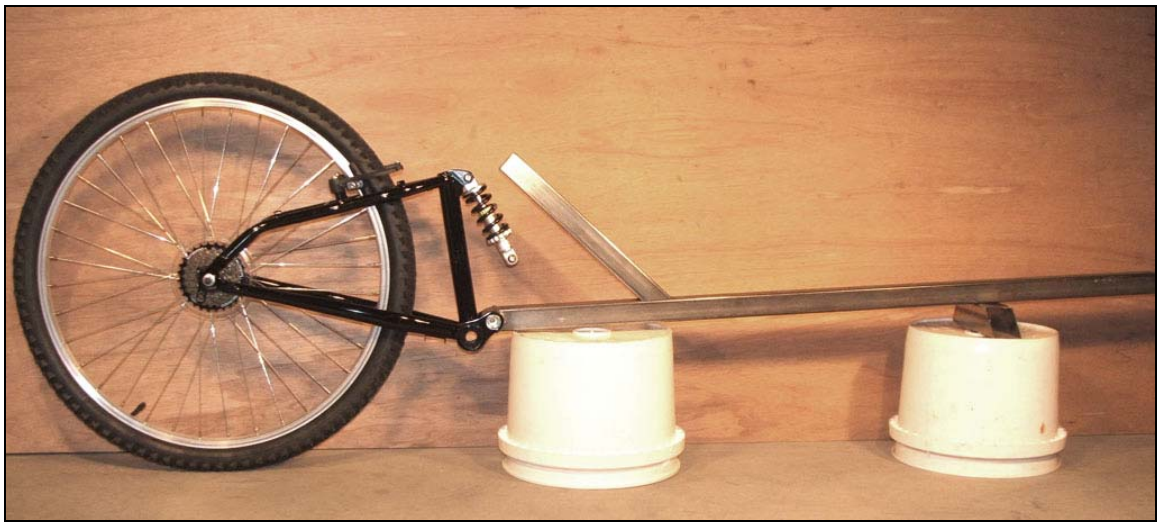

Figure 31 – Positioning the seat tube

The seat tube is placed on the main boom in a position that will allow the suspension to travel properly when the main boom is placed at the required height from the ground. I could just tell you to measure 9.5 inches from the rear end of the main boom and mark a line, but depending on the overall shape of your rear triangle and the length of your suspension spring, the measurement that I used may not work properly for you. Of course, like all of my plans, I like to derive component critical measurements by using the "set it up and look" method, which ensures that your final product works out regardless of small differences in your donor parts. There are two conditions that need to be satisfied here, and to ensure that you get the correct placement of the seat tube, you will need to install the proper rear wheel with a fully inflated tire and have the suspension spring you plan to use installed on the rear triangle.

The first requirement is the clearance from the underside of the rear boom to the ground, which should be 9 inches. For this, I simply found a bucket that was 9 inches tall and placed it under the main boom as shown in Figure 31. With the boom supported and rear triangle populated with the wheel and suspension spring, it is easy to see where the suspension spring needs to connect to allow at least 2 inches of spring travel (requirement number two). Try to choose a seat tube position that allows the rear wheel to be lifted off the ground two inches, but keeps the seat tube as far back as possible to keep the wheelbase short. The next few steps will make this clearer.

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Figure 32 – Optimal seat tube placement

If you place the seat tube way ahead of the rear triangle and try to connect the suspension spring to the very top of the seat tube, you will have added an extra 6 to 8 inches of unnecessary length to the frame. Sure, this would indeed work, and might be a good way to earn some battery or luggage space, but unless that is your goal, the seat tube should be placed as far back as possible, putting the suspension spring mount lower on the seat tube.

In Figure 32, I have the seat tube taped to the main boom as I try to find the optimal mounting position, which was about 9.5 inches from the center of the pivot tube to the rear edge of the seat tube. If I lifted the rear wheel off the ground two inches, the top of the triangle had about half an inch of clearance before it would strike the top of the seat tube, so this was just fine for my suspension spring, which had only 1.75 inches of total travel. When you find the magic place, just mark that position on the main boom so you can weld the seat tube in place.

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Figure 33 – Seat tube tack welded

Figure 33, shows the seat tube tack welded to the optimal place on the main boom. A small tack weld is first placed in the center of the joint so you can ensure that the seat tube is inline with the rest of the main boom. View the two parts from all angles, and manipulate the seat tube if an alignment adjustment seems necessary.

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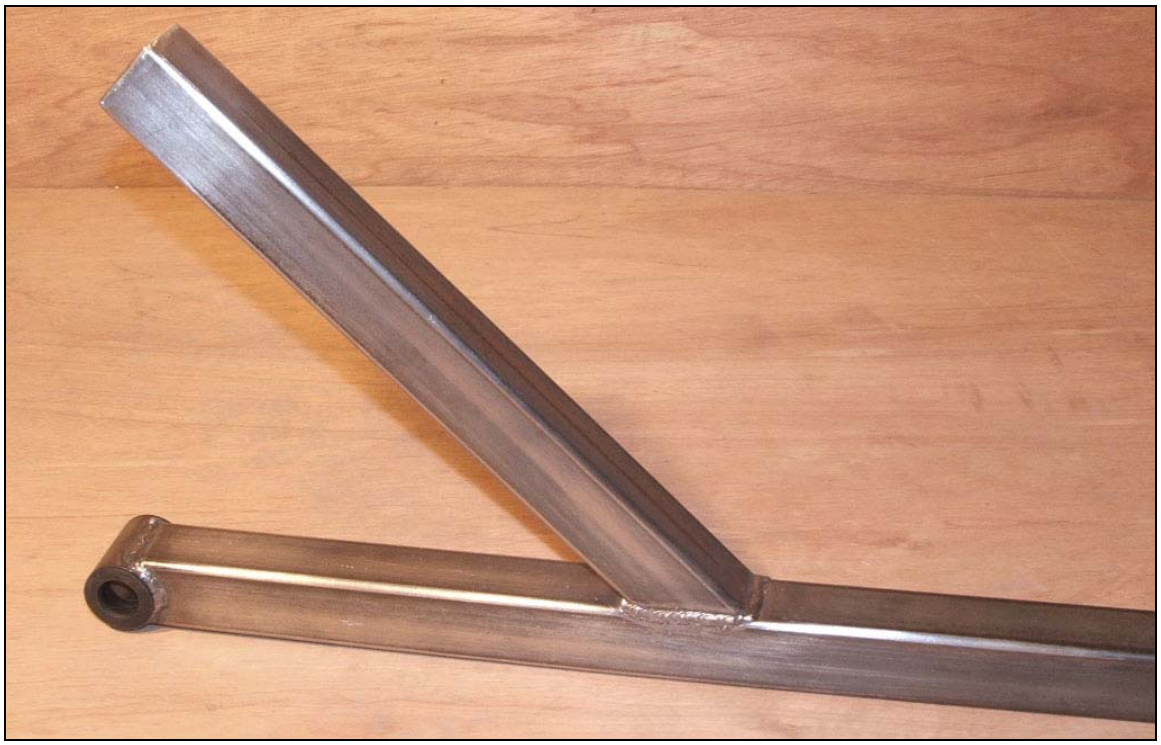

Figure 34 – Seat tube welding completed

When welding square tubing, order of welding can make a huge difference in the amount of heat distortion that will form as the weld metal cools. On the seat tube joint (Figure 34), the alignment is more critical from side-to-side as it is on the top of the boom where the seat tube makes the 45 degree angle with the main boom, so the top joints on the main boom were welded first, followed by the two joints on each side of the boom. The first two welds basically “lock” the joint from any further distortion, or at least minimize it.

The steep angle on the opposite side of the 45 degree angle is a little tricky, so take your time and get it right. A little more amperage into that joint might keep your arc welder from sticking. When the seat tube is completely welded to the main boom, there should be very little side-to-side deflection if viewed from the top of the frame or from either end. The suspension spring mount will be installed after the front wheels have been attached, which is the next step.

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Front Wheel Arms

Figure 35 – The two front arm tubes

The two front wheels are held to the main boom by two tubes I call the “front arm tubes” (Figure 35). On some trikes, these two tubes are a single length, which would be called a “cross boom”, but to ensure that shorter riders can enjoy the StreetFox without having their ankles rubbing on the frame, I decided to go with two tubes placed on an angle to give shorter riders a lot more foot room.

The standard track (measurement across tire centers) is 30 inches, but this is another easily modifiable aspect of this project. If you are on the large side, you may be more comfortable with a 32 inch track, or may have radical plans to make the StreetFox into a lowracing speed machine, so a 27 inch track might be your goal. For every day riding and good stability, a track between 30 and 32 inches seems optimal, so I decided on a 30 inch track.

Again, measurements may change slightly depending on the width of your front hubs, length of your head tubes, and type of hub hardware, so we will make all cuts a little longer than needed and work backwards, using your parts as a guide. Start by cutting the two front arm tubes to a length of 16 inches as per Drawing 3.

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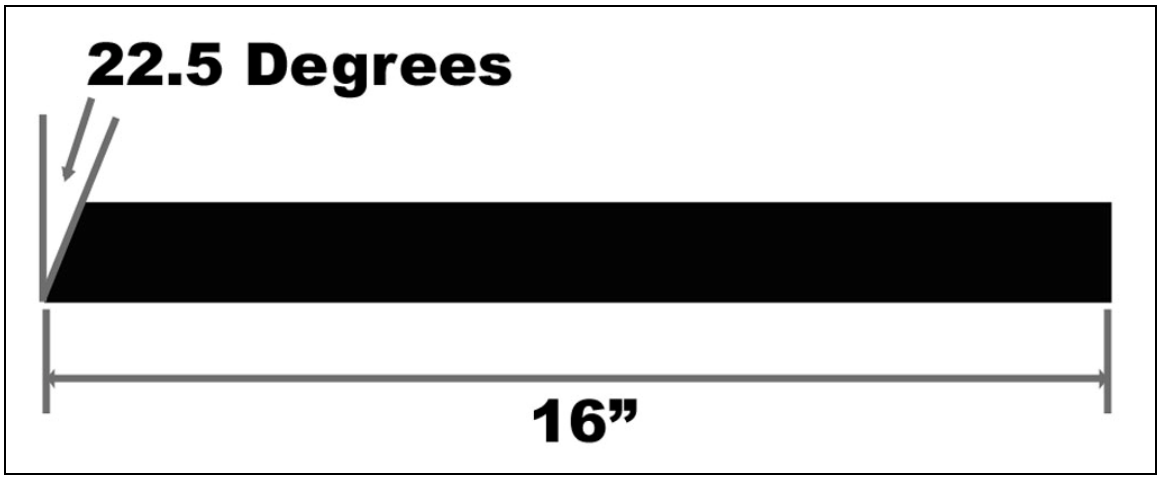

Drawing 3 – The front arm tube dimensions

As shown in Drawing 3, the two front arm tubes are 16 inches in length, with a 22.5 degree angle cut off one end of each tube. 22.5 degrees is half of 45 degrees, so if you fold a piece of paper diagonally twice, you will have a handy guide to check the 22.5 degree angle.

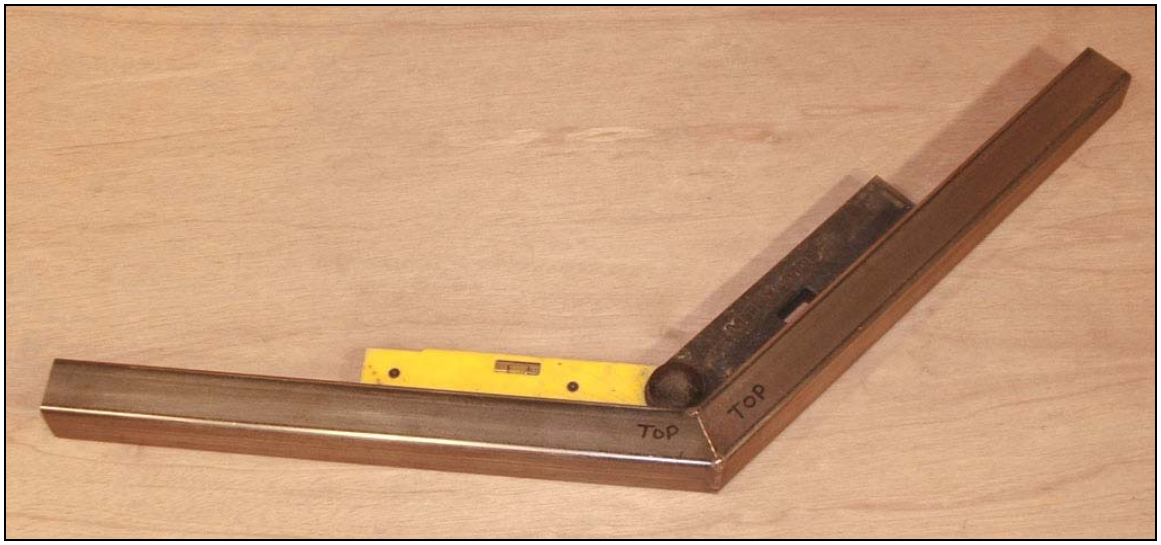

Figure 36 – Jointing the two front arm tubes

The two front arm tubes are welded together at the angle cut ends so the form a total angle of 135 degrees when welded together. An angle checker verifies that I am very close to the desired 135 degrees (Figure 36). Welding is done on the front and rear of the joint and then on only the top of the joint, leaving the bottom of the joint untouched so it can sit against the main boom tube perfectly flat. If you were to weld all the way around the two arm tubes, alignment of the main boom tube would be difficult since the weld would create a high spot. As you will soon see, the side of the joint that

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sits on the main boom tube does not need welding as it will be secured be the welding between the rest of the front arm and main boom joints.

Figure 37 – One side of the front arm pair is not welded

Figure 37 shows the side of the newly joined front arm pair that was left unwelded so it can sit flat against the main boom tube. If the welding at the ends of the other joints has created a high spot on this side of the joint, grind off any of the excess welding bead until you can place a flat object directly over the joint so it sits perfectly flat.

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Figure 38 – Front arm tubes fully welded

The top side of the front arm tubes is fully welded as shown in Figure 38. Since the front arms are now joined to create one single piece, I will now refer to them simply as the "front arm boom".

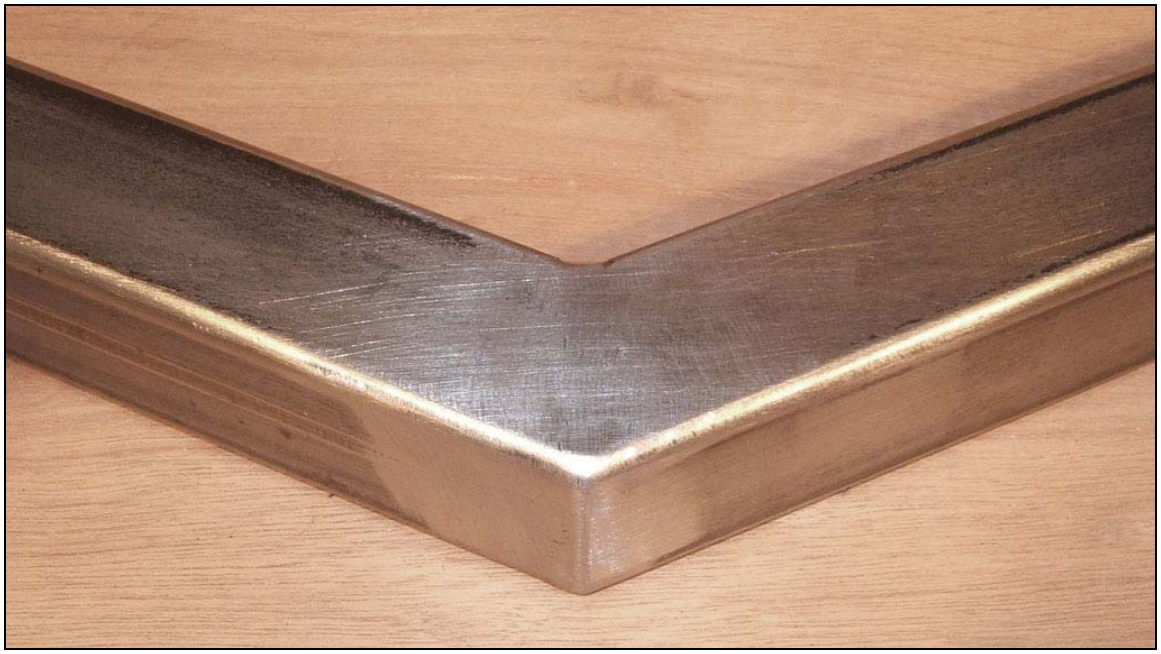

Figure 39 – Cleaning up a welded joint

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Whenever a non-critical weld is clearly visible, I try to grind the weld metal flush with the original tubing for aesthetic purposes. You might think that the weld holding the two arm tubes together is one of the most strength critical welds on the entire frame, but as you will soon see, the joint between the main boom and the unwelded side of the front arm boom is what really holds the front arm boom to the main boom so you can easily afford to clean up the top weld. Figure 39 shows the results of some careful grinding and touch ups using a flap disc. While cleaning up welds, be careful never to dig into the weld material, creating a valley in the joint. A little hill over the joint is much better than a little valley, which could seriously compromise the strength of the joint.

Figure 40 – Head tube to tire center distance

Now that you have the two front arm tubes joined together, forming the front boom, you must trim them down to achieve the desired track, since the initial measurement given was longer than you need. Because track is measured across the fully inflated tire centers, you will need to have your front wheels installed on the head tubes with fully inflated tires and all the head tube hardware installed.

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As shown on Figure 40, you need to know the distance from the center of the head tube to the center of the tire (or rim) in order to determine how much material needs to be trimmed off of the front arm boom in order to end up with the desired track. Again, 30 inches is a good track width to shoot for unless you have other requirements. It may be difficult to measure the distance form the center of the head tube to the rim center with military accuracy, so just try to get a decent estimate within a quarter inch or so. My measurement was 2 inches, but yours may differ slightly

Figure 41 – Calculating track based on the arm boom

Once you have determined how far it is from a head tube center to the rim center, you can use that measurement to figure out how much length needs to be cut from the arm boom to get the desired track width. We took the measurement from the center of the head tube, since this is approximately where it will end up once you cut the fishmouth out of the arm boom to weld it in place.

Now, run a measuring tape across the arm boom assembly from center to center as shown in Figure 41, so you know what the track would be right now if the arm boom was left uncut. The distance across my arm boom assembly from center to center is currently 28.5 inches, so if I add the extra width given by the two head tubes (2 inches X 2 = 4 inches), I would end up with a 32.5 inch track. Obviously, I will need to chop off 1.25 inches from each arm on the arm boom assembly to end up with the desired 30 inch track. Therefore, the distance across my arm boom assembly needs to measure exactly 26 inches after trimming.

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Figure 42 – Measuring the total arm boom width

Figure 42 shows a close-up of how the arm boom is to be measured across its width. A small mark indicating the center of the tube is drawn, and this is where the measurement is taken at each end of the arm boom assembly.

Figure 43 – Trimming the front arm boom at both ends

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After a little calculating magic, I have determined that the overall width from point-to-point on my front arm boom assembly needs to be reduced by 2.5 inches, so I have marked a 1.25 inch cut line at the end of each arm as shown in Figure 43. The resulting center-to-center distance of my arm boom will soon be 26 inches, which will create a trike with a 30 inch track by adding the distance from each head tube to the wheel center (4 inches total).

Figure 44 – Cutting the head tube fishmouth

The head tubes are welded to the ends of the front arm boom at such an angle that the tires end up at 90 degrees to the ground. Since we are using center point steering, the head tube angle is not the same as the axle or the wheel, so this needs to be taken into account when cutting the fishmouth joint on each end of the front arm boom. For now, simply trace a line using a head tube (or something of equal diameter) on the top of the front arm boom assembly as shown in Figure 44. The top of the arm boom is the side with the weld, opposite of the non welded side.

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Joining the Booms

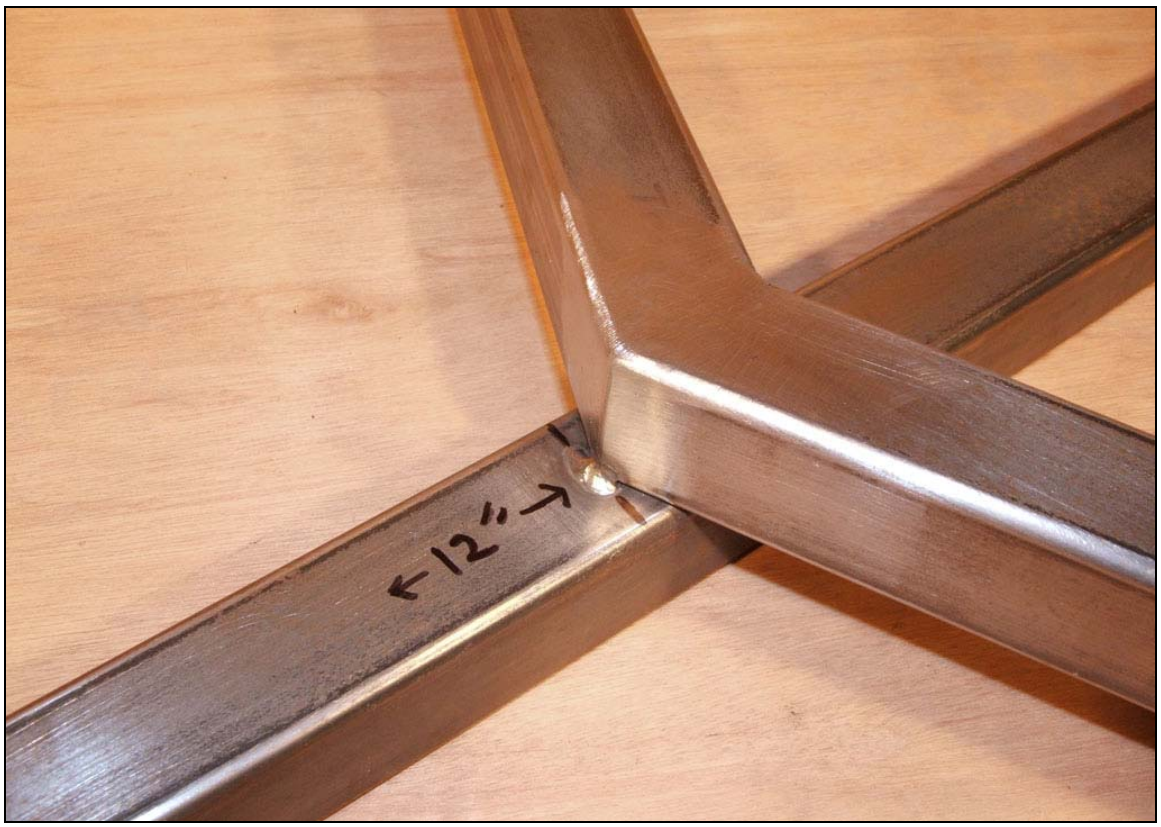

Figure 45 – Joining the arm boom to the main boom

The front arm boom will mate with the top of the main boom at a distance of 12 inches as measured from the point of contact to the 45 degree corner formed between the seat boom and main boom. This distance allows plenty of room to mount your seat base, and places the handlebars in an easy to reach comfortable position.

Figure 45 shows the first tack weld made at a distance of 12 inches from the seat corner as described. A single tack weld is made so the angle can be checked and easily adjusted if needed in order to get the two arms at the same angle in relationship to the main boom tube. An adjustable square or angle finder is used to compare each side, making slight adjustments until they are both equal. At that point, you can place another tack weld on the front of the joint to lock down the angle.

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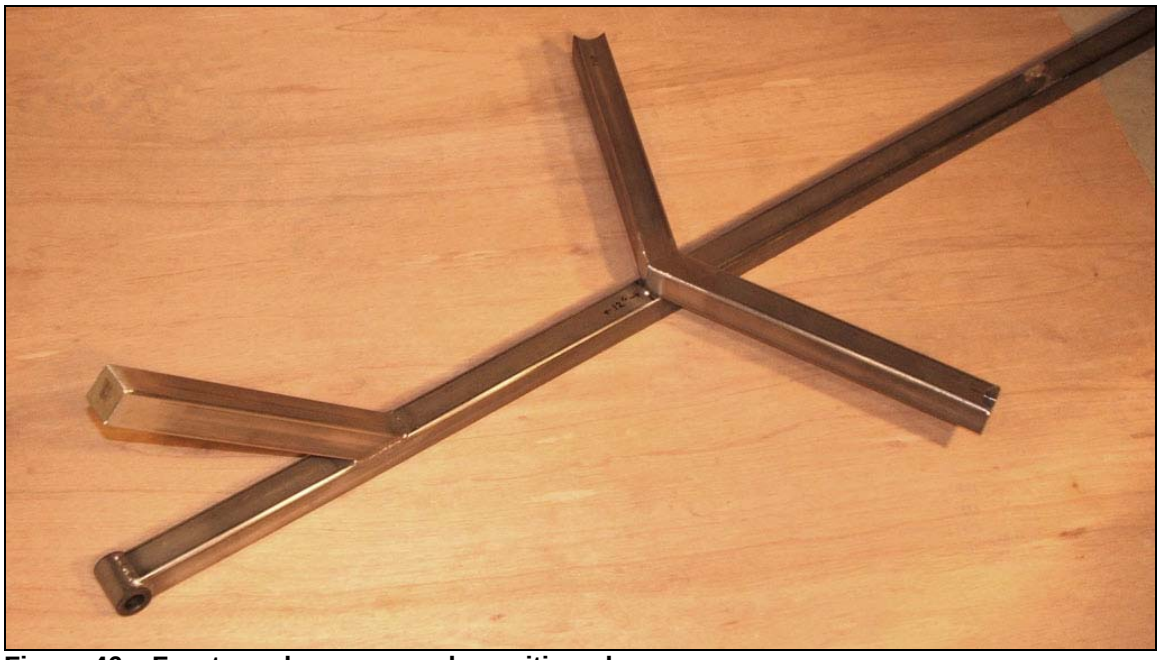

Figure 46 – Front arm boom properly positioned

Figure 46 shows the front arm boom tack welded in two placed along the top to lock it in position after the angles on each side have been checked to be equal. Notice there is plenty of room (12 inches) for your seat base, so you can use very thick seat padding if you like. A mesh seat with a frame could also be installed as there is plenty of room. Also notice that the arm boom s welded on the top side of the main boom, which will help keep your chain line and steering system simple and clean.

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Figure 47 – Front arm boom welding order

With the angles between each arm and the main boom equal, complete the joint by welding the two top sides first. You will want to use a clamp of vice to hold the boom securely to the frame to avoid any side-to-side distortion caused by welding heat. Figure 47 shows the completed welds on the front and back side of the arm boom and main boom.

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Figure 48 – Completing the underside boom joints

Once the top of the arm boom and main boom joint is welded, you can finish up on the underside of the joint as shown in Figure 48. Use the smallest bead of weld you can in order to keep heat distortion to a minimum, and make sure you weld both sides using equal amperage and travel speed so any deflection is equal on both sides.

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Head Tube Angles

Figure 49 – Figuring out proper head tube angles

It's time to play "good news, bad news". The bad news - the next step is by far the most complicated part of the entire build, and will most likely require more than one try to get right. The good news - after this, you are home free, as the rest of the build is going to feel like smooth sailing.

Head tube angle is your battle now, and it is by far the most difficult part of a tadpole trike build, which is why many first time builders go for the Delta style trike instead. You have to get the head tube angles correct in two ways: first the center point angle, and then the caster angle. Oh, and you have to do this twice, making sure everything is mirrored on both sides!

OK, if you are still reading, then that means you have decided to build a tadpole trike no matter what, so let's get going and begin the fun! I would recommend you use another spare head tube or some equal diameter tube as a guide so you can easily check your progress by placing the tube in the joint as shown in Figure 49.

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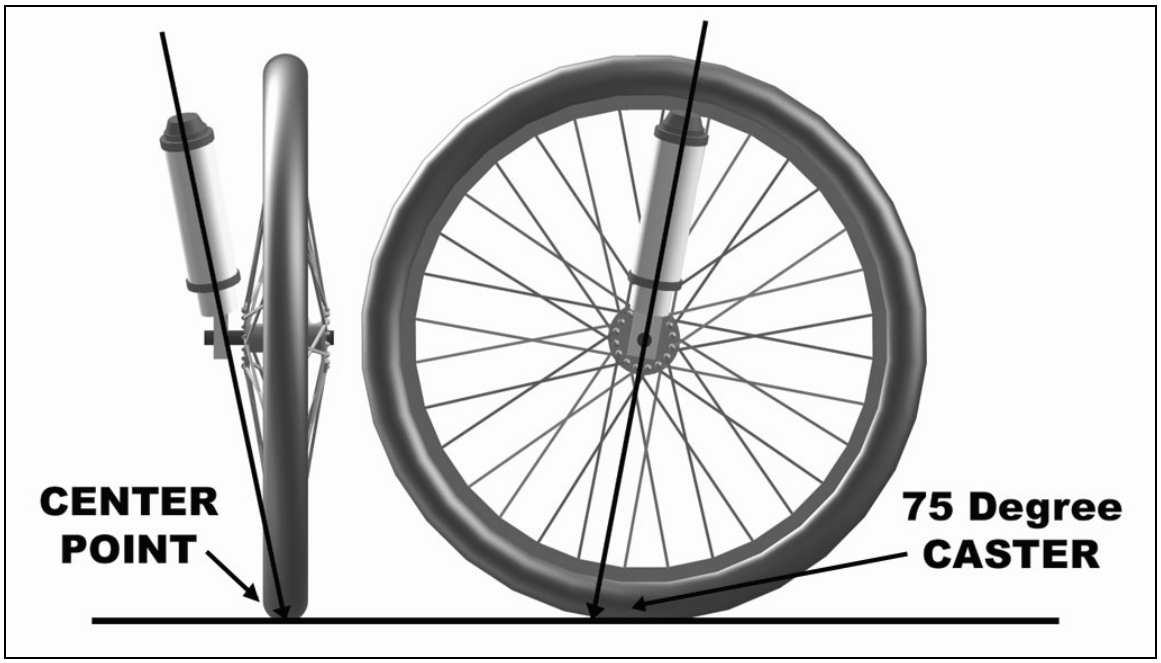

Drawing 4 – Head tube angles of concern

As shown in Drawing 4, you have to get the head tubes on such an angle that the wheels are standing at a 90 degree angle to the ground, and the head tubes are angled slightly forward, creating the desired 75 degree caster angle. The 75 degree angle allows the wheels to self center, creating a more stable ride at high speed with a good degree of response.

If you relax the caster angle too much, your wheels will tend to flop from side-to-side and you will increase your turning circle by reducing the amount of steer. If you make the head tube angle too steep, then your steering will be instantly responsive and somewhat "twitchy", especially at higher speeds, where you will tend to wobble back and forth as you pedal hard. 75 degrees seems to be a good angle for a trike of this wheelbase, but feel free to alter this angle if you feel that you know what you are doing and how it will change the handling characteristics.

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Figure 50 – A complex fishmouth determines head tube angle

The alignment of each head tube will be determined by the shape of the fishmouth cut at each end of the front boom arm, which is why the top cutout was made earlier as a starting point to work from. You should take a small amount of metal out a bit at a time and check you angles often in order to avoid taking out too much material all at once. The odd looking fishmouth cut shown in Figure 50 is what I ended up with after spending an hour or two with a small grinding disc and a round hand file.

There is no magic formula or easy method I know of to get these angles in a hurry, so be prepared to spend some quality time with old fashioned hand tools. What about a frame jig? Don't professional frame builders use those? They sure do, but how do you make sure the jig has the correct angles? Or how do you ensure the jig is going to be rigid enough to withstand the forces of welding? Wood is certainly out. In the end, it would be twice as much work to create a proper jig, and a professional custom jig for this project would cost 10 times the price of a manufactured trike imported from across the globe. Patience is the only way to win this battle.

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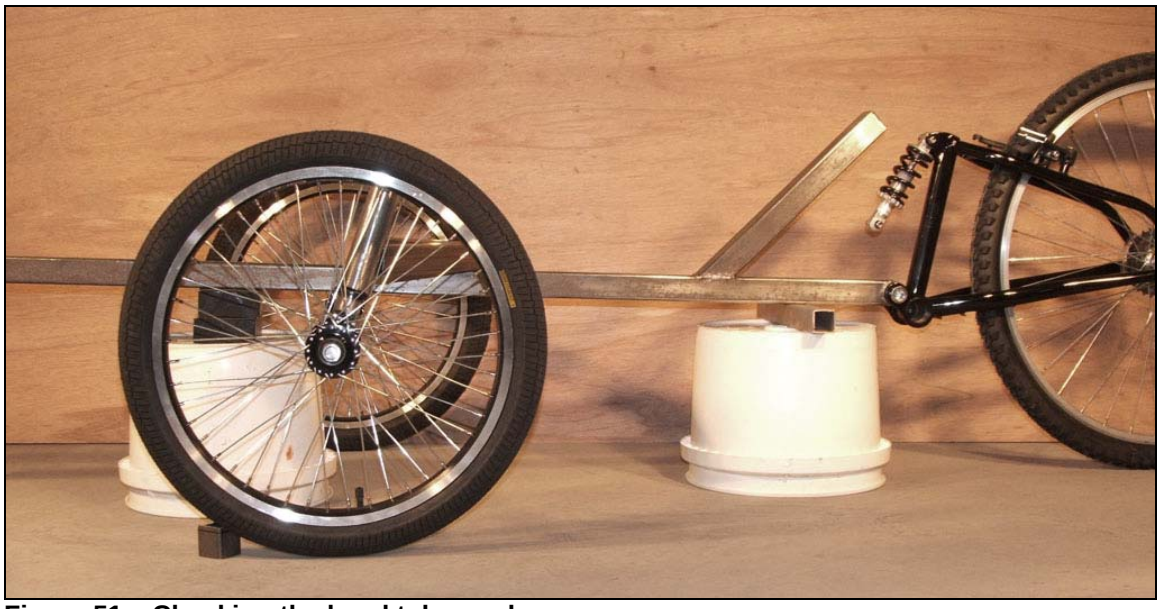

Figure 51 – Checking the head tube angles

Using my favorite bucket trick, I raised the front boom up to the correct height so I could check my work each time I took a little metal out of either of the fishmouth cuts. The front arm boom should met each head tube as low as possible, leaving about half an inch of head tube material sticking out past the underside of the boom arm so you can weld the joint without melting the edge of the head tube. This height is not critical, since it is really determined by the height of the head tubes, but on my trike, this height was approximately 11 inches, slightly ahead of the boom joint where my bucket is placed in Figure 51.

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Figure 52 – More grinding and visual inspection

The process of grinding a little, then checking angles takes awhile, but if this was easy, then everyone would have a cool custom trike, and the results of your hard labor would then be worth a lot less! If you want to keep the head tubes locked on the fork stem, you can add some tape around the bearing cups, or simply remove the top bearings, which will keep the head tube from rolling all over the place when you are using the wheels as a guide as I am in Figure 52. No welding is done until both wheels pass visual alignment inspection from every possible angle.

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Figure 53 – Tack welded head tube

After your grinding, filing, and inspecting ordeal is over, it is time to weld the head tubes to the arm booms so you can get on to the easy stuff, like riding your trike. Again, I cannot offer any magical solutions that will ensure an instantly aligned head tube pair with minimal effort, so be prepared to fiddle, break tack welds, and try your patience.

I prefer to place the frame up high enough so I can stand back and compare the wheels to the ground, and the wheels to each other. Figure 53 shows the main boom held securely and parallel to the ground using a workbench vice. At this point, I have also placed one small tack weld on each head tube in hopes that my fishmouth cuts were close enough that I could force each head tube into alignment and continue welding. I was lucky with the left side, but the right side was visually out of alignment enough

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that I decided to do a little more filing to correct the error. This is one stage in the build where correcting your errors will make a huge difference to the look and feel of the finished product.

Figure 54 – A second tack weld locks the joint

I normally do not weld a frame with my good wheels or bearings installed, but this is one time where it is impossible to do otherwise as you really need those wheels up on the bench for close visual inspection. An old towel or cloth placed over the tire and rim will keep welding spatter off of the wheel, and always place your ground clamp on the frame, not the head tube hardware, or current will surge through the bearings and destroy them or the cups they are installed in.

With a single tack weld on the head tube, you should be able to manipulate the head tube enough to get the wheel aligned the way it needs to be, with a focus on the wheel being at 90 degrees to the ground. When the

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wheel is where it should be, another tack weld on the other side of the joint should hold that head tube securely enough to later remove the fork hardware once both sides are looking good. Remember, this alignment counts, so break a tack weld and file away if you need to.

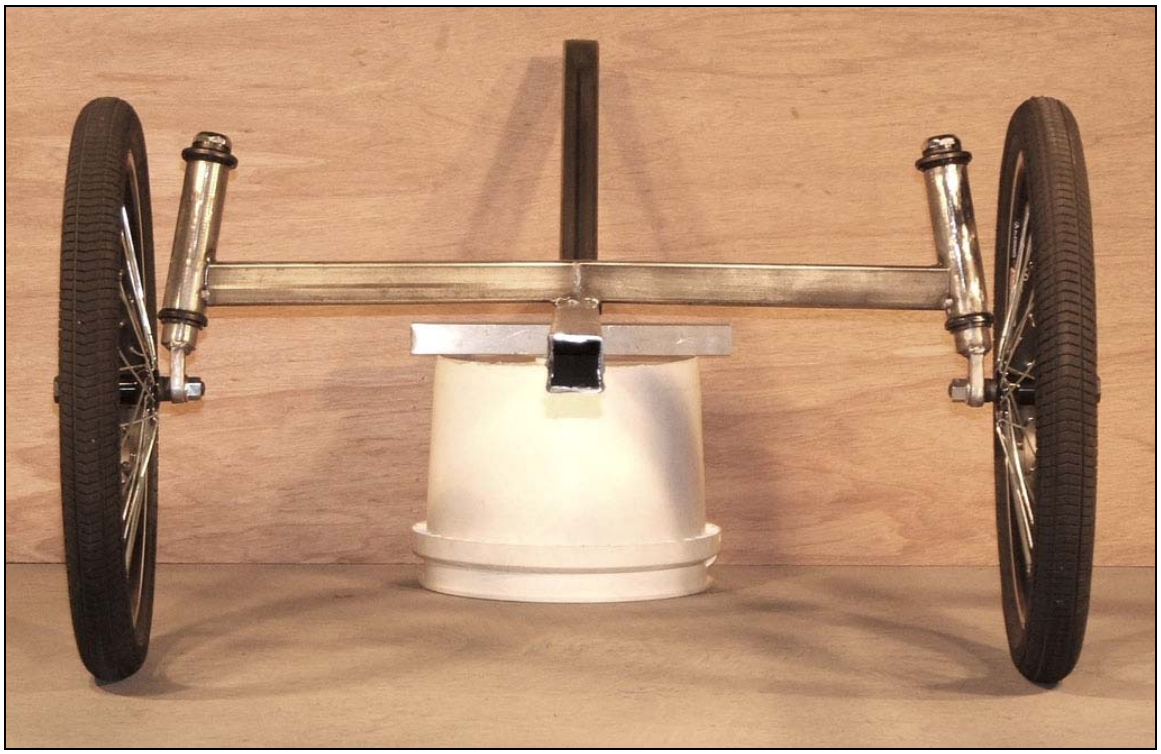

Figure 55 – Final visual inspection of head tube angles

With both head tubes securely tack welded in place; perform one last vigorous alignment quality check because the next step is the point of no return. I placed the frame and wheels back on the ground and then put both wheels in the straight ahead position so I could check their 90 degree alignment directly from the front as shown in Figure 55. If both wheels seem to be standing at a perfect 90 degree to the ground, then there is a good chance that both your head tube caster angles are also close to the desired result and equal as well.

Look through the spokes at both head tubes to see if they are both at the same angle, and a very slight difference is not nearly as bad as a wheel not being at 90 degrees to the ground. If one wheel seems to be "gimpy", then get busy and fix your work, as this will surely be seen by others and make your work look poor and your trike handling feel bizarre.

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Figure 56 – The hardest part completed

Welding the head tubes in place is done like any other welding, starting along the top of the joint, then the bottom, and finally the sides. Weld both parts using the same sequence, so any distortion is copied to both parts equally, and make sure there are no holes or gaps in the weld. It is a good idea to tap in an old head tube cup on the lower side of the head tube when you are welding as this will help keep the head tube from becoming oval from heat distortion. Figure 56 shows one of the head tubes fully welded around the joint.

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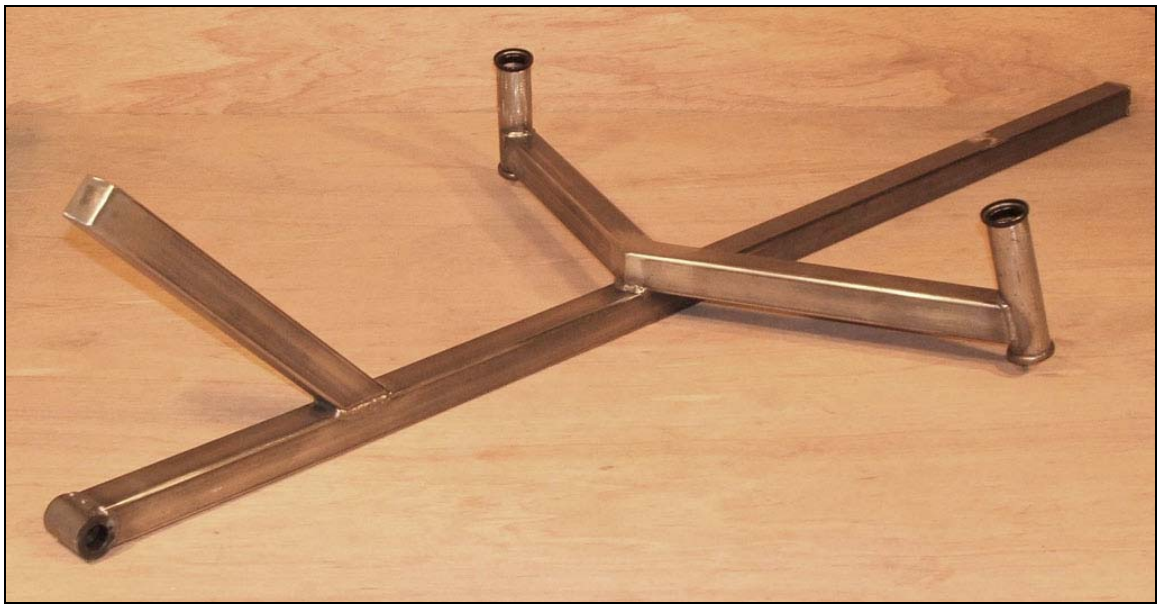

Figure 57 – The main frame is now completed

Figure 57 shows the almost completed StreetFox frame after an epic adventure with multiple and duplicate angle cutting and welding. If you enjoy bicycle building as a hobby, then every minute was pure fun, but you can sure learn appreciate the high price tag on a tadpole trike when you consider how much effort it takes to get here. If this were a two wheel recumbent bicycle, I would have been on my third hundred mile ride by now, but the final product is sure going to be worth it nonetheless.

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Suspension

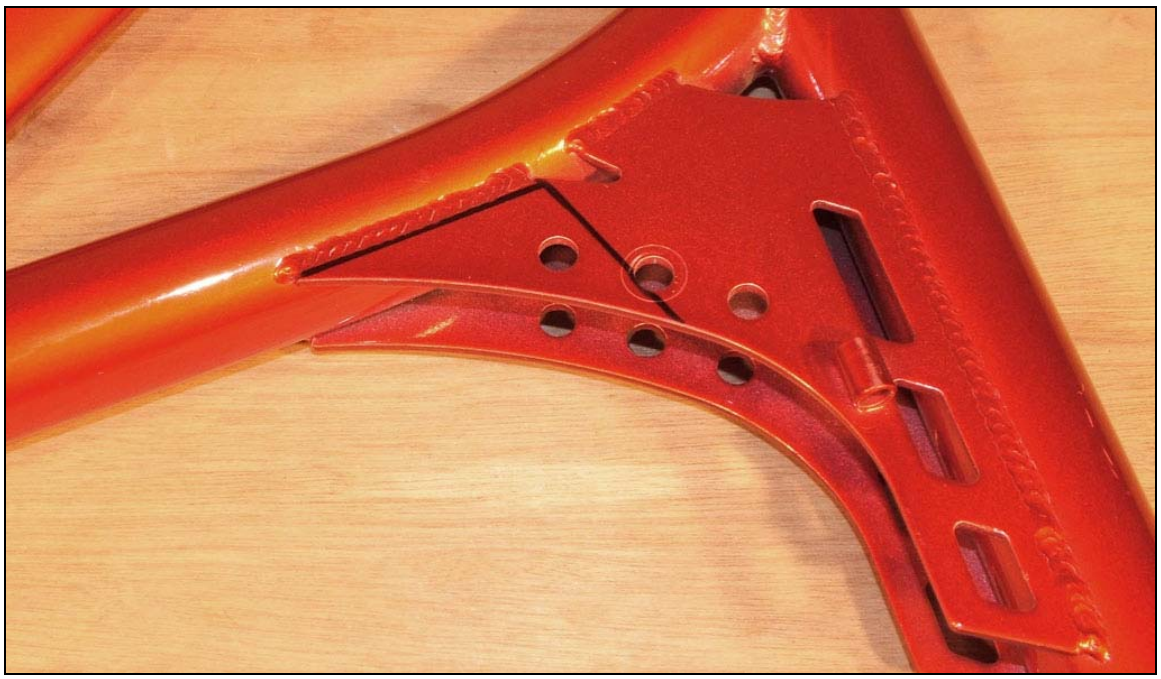

Figure 58 – Salvaging the suspension spring tabs

Once your suspension spring is mounted to the frame, you will be able to place all three wheels on the trike and roll it around your garage - a great milestone in any bike build. The suspension spring is held to the rear of the seat tube using a pair of 1/8 inch bits of flat bar, or you could simply slice them out of your donor mountain bike frame like I did. As shown on Figure 58, the suspension mounting tabs can be cut from the donor frame, bypassing the need to drill the appropriate holes for the mounting bolt.

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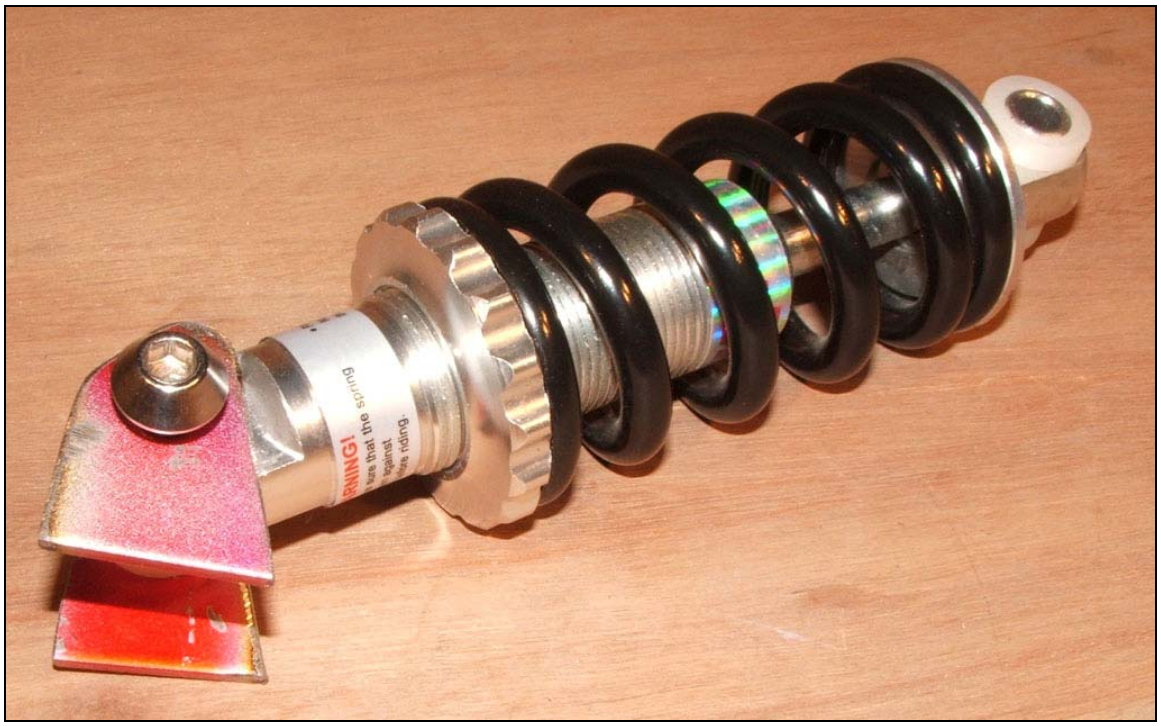

Figure 59 – Completed suspension spring tabs

The suspension mounting tabs are shown in Figure 59, salvaged from what was left of the original mountain bicycle frame. If you decide to use flat bar to make the tabs, then just make sure you make them both the same size and drill the appropriate hole in each for the suspension spring bolt.

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Figure 60 – Suspension spring position

Since you have already figured out where your suspension spring needs to be mounted, it's just a matter of installing the tabs on the suspension spring, then using it as a guide to make the first few tack welds. The spring can then be removed and the tabs completely welded to the rear of the seat tube as shown in Figure 60. I would recommend that you install the front wheels and fork hardware, and then get out that 9 inch tall bucket to prop up the rear of the frame, just so you can ensure that your ground clearance is exactly what it should be. When your suspension spring is secured to the seat tube, you should be able to jump up and down on the fame and have the suspension take it all in stride. No part of the suspension spring body should rub on the frame as the spring compresses and expands.

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Brake Support Arms

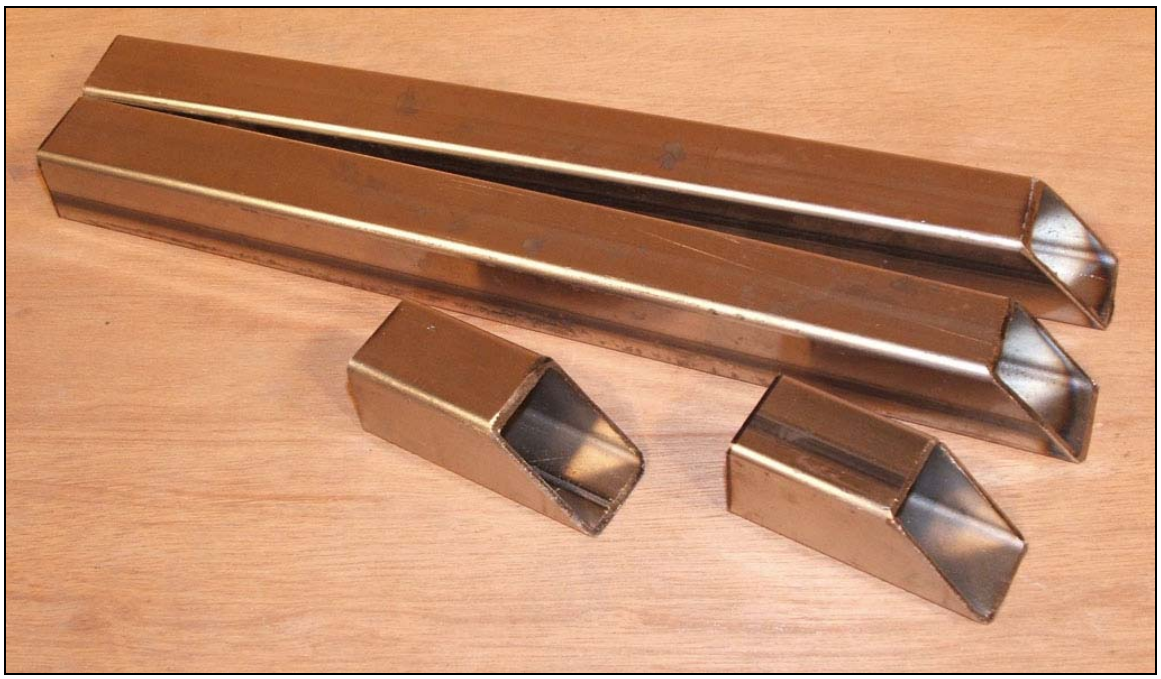

Figure 61 – Brake support arm tubing

Braking on a tadpole trike is another puzzle that is a little more complex than that of a delta trike. Personally, I would be just fine with trusting one good rear brake, and often I will leave it at that and allow the builder to decide if they want to install standard caliper brakes on the front of a bike. Of course, standard front brakes are simply not an option on this trike, since there is no place to mount them, so this will be addressed.

Some tadpole trikes have hard-to-find custom drum brake hubs or disc brake hubs with custom axles, but the goal here is to avoid all expensive or non standard parts, so I will avoid those two options. Another puzzle is what to do with three brakes and two levers, but there are always answers. To get a brake on each front wheel, you will need to make a brake support arm that allows you to place a standard bicycle brake in the appropriate place around the wheel. To do this, a pair of L shaped brake support arms will be made from some 3/4 inch square tubing with a 1/16 inch wall thickness (same thickness as the boom tubing). These tubes are shown in Figure 61, and have been cut as per the next drawing.

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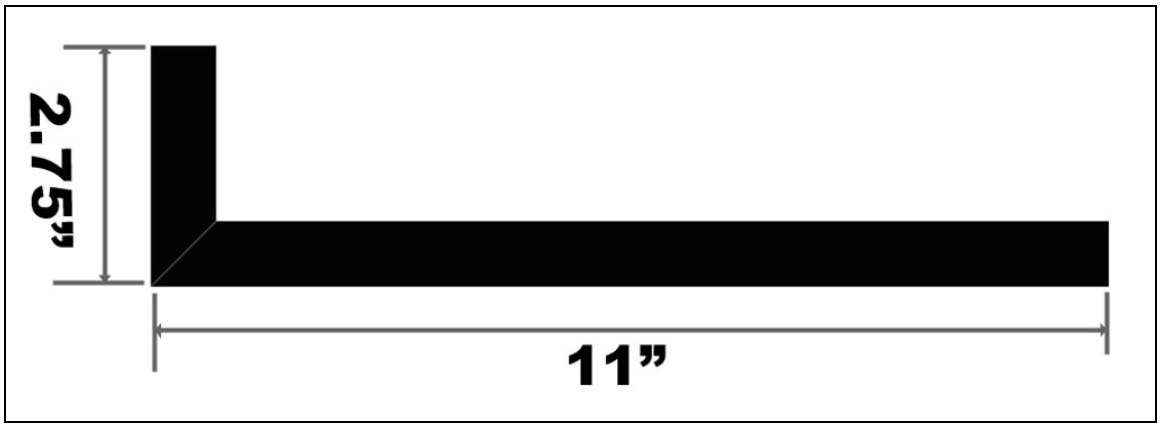

Drawing 5 – Brake support arm tubing

The brake support arms need to wrap around the inside of each front wheel to allow the installation of a standard caliper type bicycle brake. Because of the tight 1/2 inch clearance between the brake support arms and the tire, you should read ahead and consider making the length of the tubes slightly longer so you can work backwards, especially if your front tires are quite wide or have aggressive tread. The measurements given in Drawing 5 are based on a 2 inch wide 20 inch tire with minimal tread, which is a common choice of tire for this project. Much wider and taller tires are certainly available.

Figure 62 – Brake support arms tack welded

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The two brake support arms are shown in Figure 62 after tack welding them together for a test fitting. The brake arms will connect to the fork crown (shown ahead in Figure 64), and should come around the tire so that there is 1/2 inch between the widest part of the tire sidewall as well as between the top of the tire and the small 90 degree portion of the brake support arm. Basically, you are making a "half fork" to emulate the way a caliper brake would hug the tire on a typical front fork.

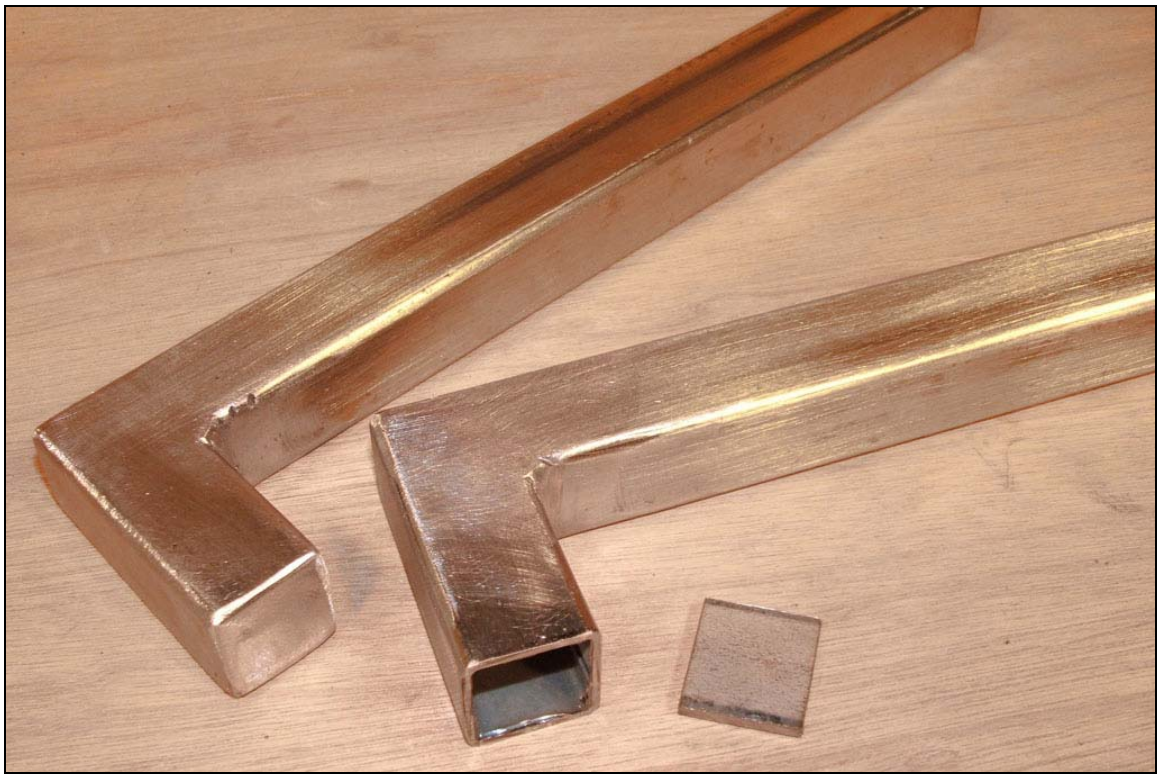

Figure 63 – Capping off the open tubing ends

If you are satisfied with the position of the brake support arm in relationship to your front tire, then completely weld around all of the joints and then cap off the open ends of the tubing as it was done for the seat tube. Avoid weakening the joint by grinding away too much weld metal if you decide to clean the welds flush with the base metal like I have. Figure 63 shows the brake support arms being capped and cleaned right before permanent installation onto the fork stems.

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Figure 64 – Installing the brake support arms

The brake support arms are connected directly to the fork crown at a 90 degree angle as shown in Figure 64. Ensure that the clearances between the arm tubing and the tire are not les than 1/2 inch, so a few scraps of 1/2 plywood in between the tubing and the inflated tire can be used to help while you are tack welding the parts together. The brake support arms are only tack welded in one spot at this point, so they can be aligned properly with the wheel.

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Figure 65 – Proper brake arm and tire clearance

Figure 65 shows how the brake support arm should look when viewed from the top of the wheel. Notice that the arm comes from the fork stem at a bit of an angle as it heads towards the outer edge of the tire. The result is 1/2 inch of clearance between the top and side wall of the tire and the brake arm tubing. If you think of the brake support arm as a one sided chain stay, then the angle and tire clearance make sense. The brake will be bolted over the edge of the tire just as it would be done on a typical bicycle.

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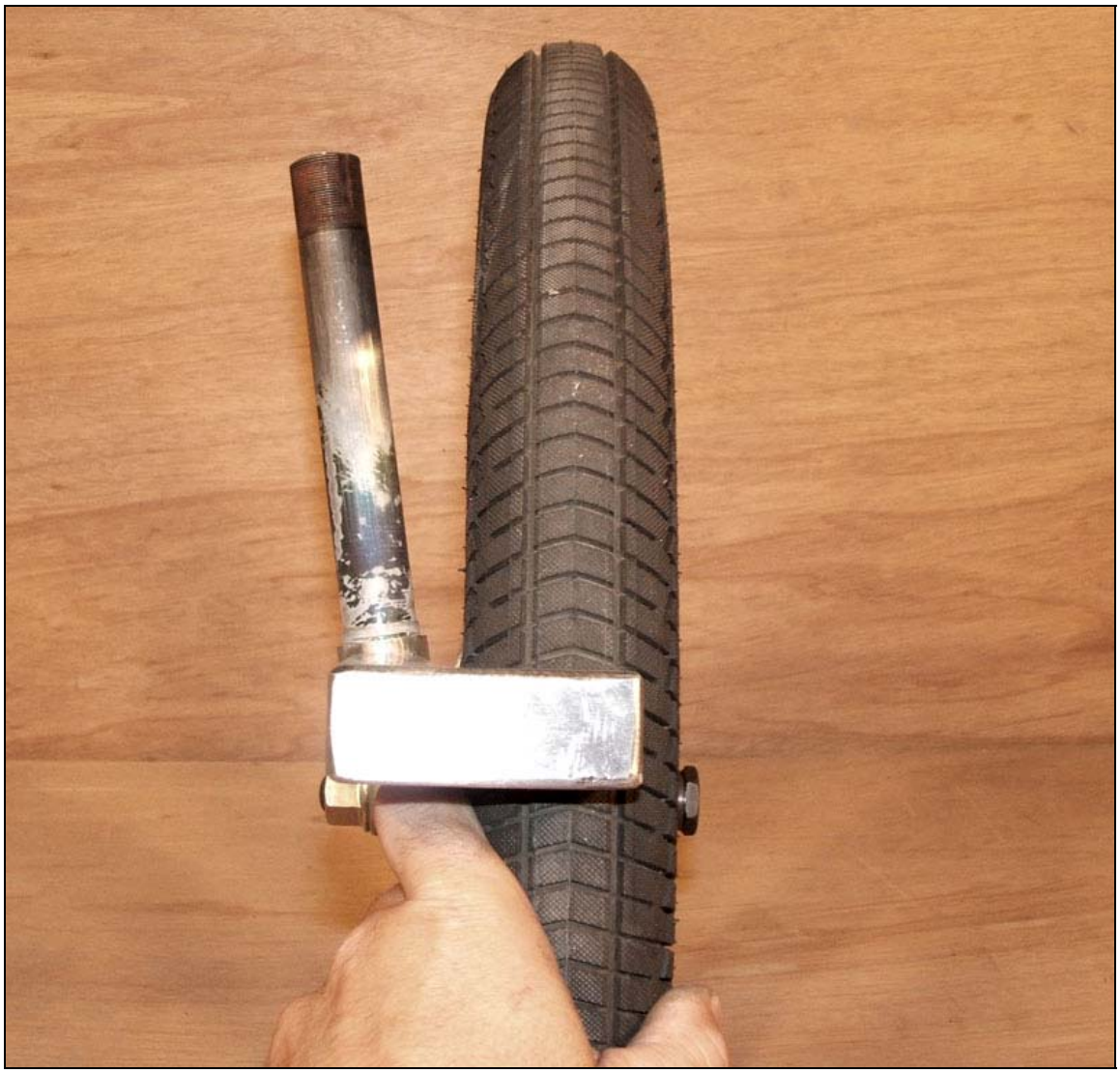

Figure 66 – Brake arm viewed head on

Figure 66 shows the brake support arm as viewed from the end. Notice the small tube is at 90 degrees to the tire rather than the fork stem to which it connects. This is necessary as the brake also needs to be mounted at 90 degrees to the wheel so the brake pads hit the edge of the rim squarely.

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Figure 67 – Welding the brake support arms

The brake support arms can be completely welded to the fork stem crown as shown in Figure 67 once you have checked the alignment with the tire. Welding should be solid and gap free, as the brake arms will be put under considerable stress during a fast stop from high speeds.

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Figure 68 – Brake arms fully welded

The same process must be done to both brake arm support tubes, making sure alignment with the wheel and rim is correct for proper braking contact. Figure 68 shows the two completed parts ready for installation.

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Ackermann Steering

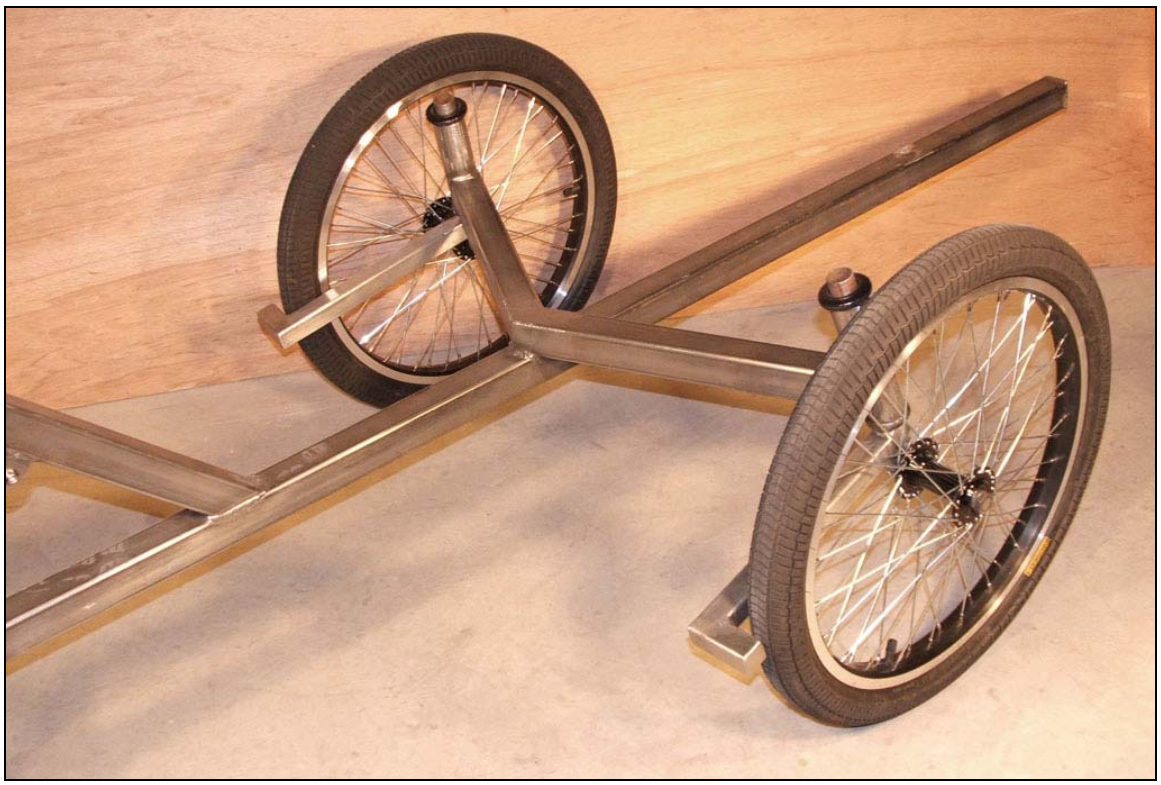

Figure 69 – Getting ready to install steering linkage

At this point, you can roll your trike forward and the two front wheels will fall into line and automatically track together due to the caster angle of the head tubes (Figure 69). Of course, you can't expect this to be safe on the road, and if you try to move the trike in reverse; the two wheels will point together and instantly lock up the vehicle.

Like any vehicle with dual front steered wheels, the two wheels must be made to turn together, taking into account that the wheel on the inside of a corner must actually turn sharper than the wheel on the outside. This might sound like a complex problem best solved by some computer controlled hardware system, but is actually a very simple problem to solve. The name for this type of steering is "Ackermann Steering", and you can learn a lot about how it works by hitting your favorite search engine for more information.

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The good news is that I have figured out all of the proper steering geometry by hours of enjoyable trial and error, so you will not have to, although knowing how and how it actually works is always a good thing.

Figure 70 – Steering control arms and bolts

The two front wheels will turn together because they are joined by a pair of steering control arms, a pair of spherical rod ends (ball joints), and a control rod. The position of the control arms in relationship to the pivot point of the fork stem actually determines how much one wheel increases its angle on the inside of a corner, so we can say that Ackermann Steering is just a factor of control arm placement.

If you have too much Ackermann effect, then the inside wheel will start to scrub or completely lock up as it flops all the way against the frame. If you have too little Ackermann angle or none at all, then one of the wheels will have to scrub around every corner, causing you to slow down and wear out your front tires in a hurry. Figure 70 shows the two control arms, which are nothing more than 2 inch long pieces of 1 inch wide flat bar with a thickness of 1/8 to 3/16 inches. The holes are drilled approximately 1/2 inch from the ends, and are the size needed to connect the ball joints that you decide to use. Ball joints with a 3/8 hole diameter are a good choice.

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Figure 71 – Control arm placement

Mark a point on the underside of the brake support arm 5 inches from the welded joint as shown in Figure 71. This location is where you will install the control arms for proper Ackermann steering compensation. The “X” marked on the far side of this line indicates that the control arm is on that side of the line, not on the center of the line. To determine this control arm location, I spent the day trying random places along the brake support tube using many different length control arms until I could make every possible turning circle with little or no tire scrub. This took at least 20 attempts!

There are formulas and charts available on the Internet that can help determine this for you, but I found that "trial and error" is the best method. Old fashioned hard work is always the way to win any battle!

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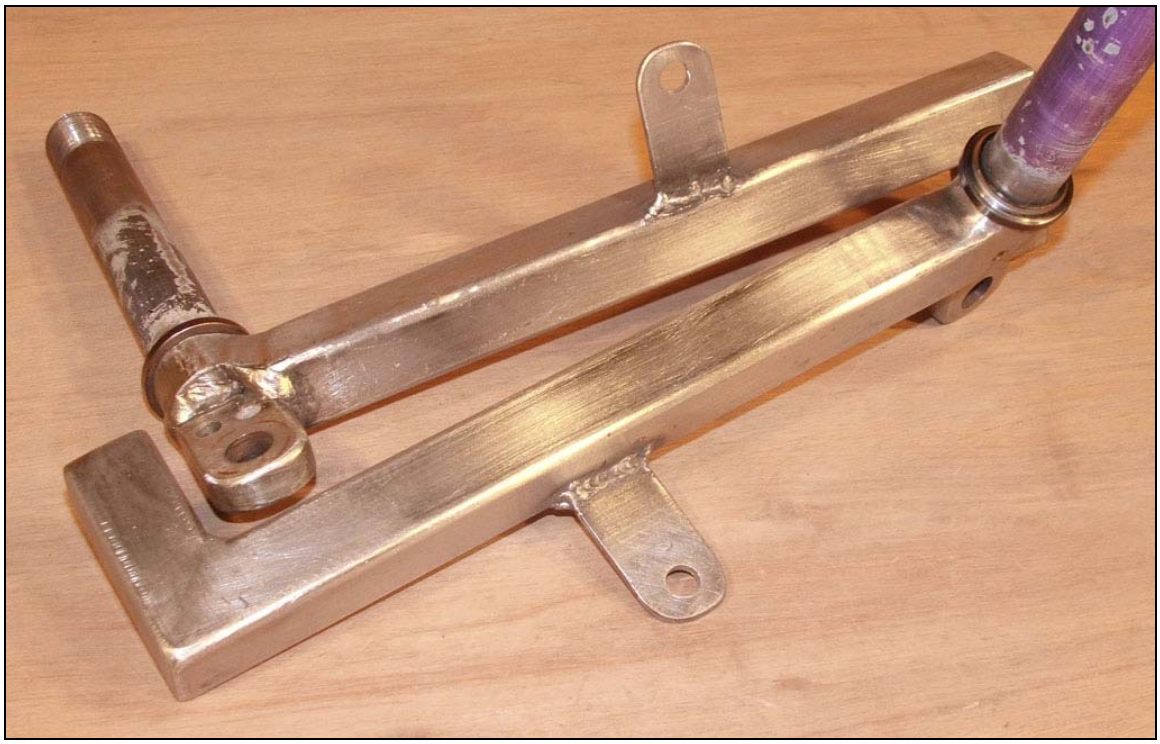

Figure 72 – Both steering control arms installed

Figure 72 shows the two control arms welded to the brake support tubes so the distance between the edge of the control arm and the fork stem is 5 inches. The 3/8 inch holes drilled in the control arms match the ball joints I found at the local hardware store.

Figure 73 – Ball joints and control rod

Ball joints are actually called "spherical rod ends", so remember that if you are asking for them at a bearing store, as they like to use the proper

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terminology. Most of us just call them ball joints, so I will continue to do so from now on!

The two ball joints and the control rod are shown in Figure 73. My ball joints have a bolt on the body, and require a bolt to hold them through the ball holes, while some may be the opposite; including the bolt on the ball part instead. It really is not important which type you choose, as long as the bolt or bolt hole is no smaller than 3/8, and the ball or bearing is not made of plastic. The control rod is just a 1/2 inch hollow tube from the hardware store with a 1/16 inch wall thickness. The 3/8 bolt just fits into the tube, so this allows a nut to be welded at each end of the tube to make the steering alignment adjustable.

Figure 74 – The ball joint bolt fits into the control rod

Figure 74 shows how the 3/8 bolt on the ball joint body fits right into the hollow control rod, using a nut to allow the ball joint to be adjusted about 1/2 inch up or down. This nut will be welded directly to the end of the control rod and then another nut will be used to lock down the ball joint once the two front wheels have been perfectly aligned. The length of the control rod is determined by installing all of the front wheel hardware and the rear wheel then walking the trike forward until both front wheels have tracked together for at least a 4 foot distance. At this point, try not to disturb the

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front wheels as you measure the exact distance from the center of each hole on the control arms that you just welded in place. You can then subtract whatever length is needed from this measurement so that the ball joint holes will be the same distance apart as the holes in the control arms. The ball joints should be set up so they can be screwed in or out the same amount, allowing optimal tire alignment fine tuning in each direction.

Figure 75 – Nuts welded to the control rod

Figure 75 shows what the completed control rod should look like once the nuts have been welded at each end of the tube and the ball joints screwed in and locked down. At this point, the center-to-center distance between ball joint holes is exactly the same as the center-to-center distance between the control arm holes after rolling the trike forward. I did not even have to do any fine tuning of the steering alignment after this point, as the steering was tracking perfectly and friction free after assembling the trike for the very first time

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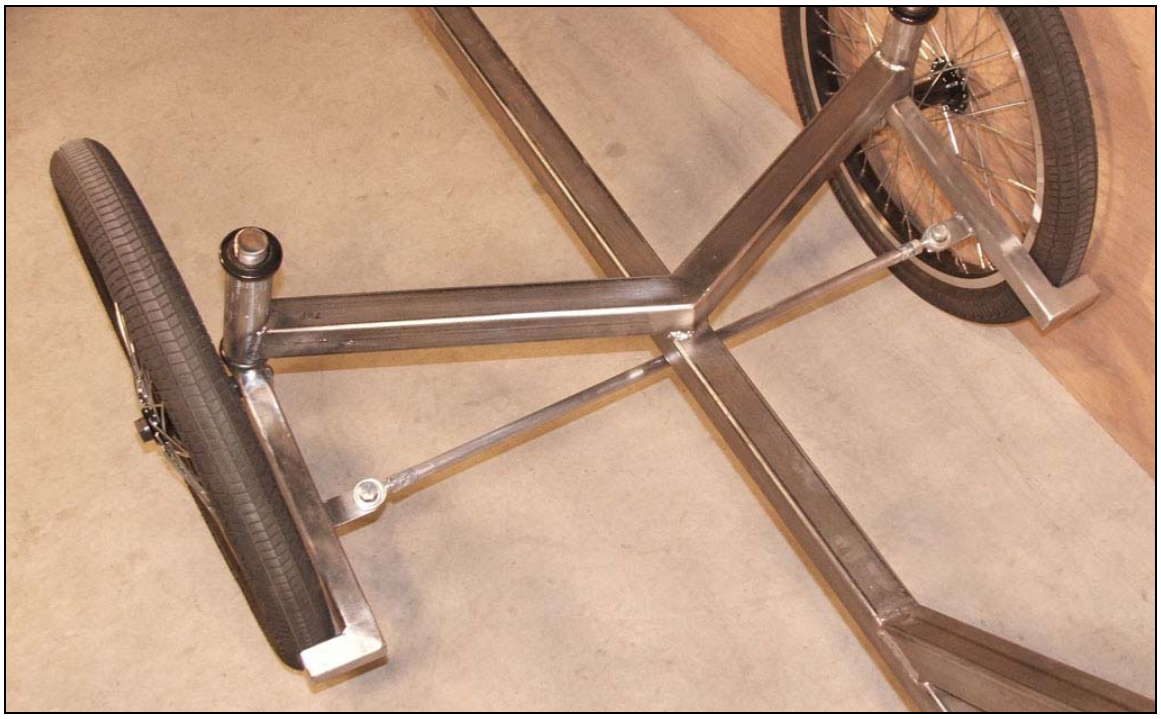

Figure 76 – Both front wheels are now linked

Figure 76 shows the control rod installed by putting a bolt through the ball joints and the two control arms. I would recommend you use good quality bolts with locking nuts for all steering hardware, so that the nuts don't work their way loose over time due to vibration. If you lose the control rod at high speed, one wheel may flop to the side and cause the vehicle to roll or steer wildly out of control. Don't take chances with low quality parts on steering or braking components.

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Figure 77 – Steering linkage detail

The ball joints are placed on the top of the control arm as shown in Figure 77, so they are easy to inspect every once in awhile. You could certainly place them on the other side of the control arm, but then they are always hidden from your view.

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Figure 78 – Testing the completed steering

Once the steering system is ready for testing (Figure 78), the trike should roll in a straight line without any resistance, and steer around most sharp corners without any tire scrub. Obviously, steering too far in one direction will cause the inner wheel to travel past the steering center and literally flop all the way over, but in normal steering conditions, this will never happen.

If you move the wheels from side-to-side, you can really see how the Ackermann steering affects the inside wheel, casing it to steer at a tighter angle the farther you move the outer wheel. If your trike seems to roll with any friction or obvious tire scrubbing, then you will have to unbolt one of the ball joints and adjust it properly. Remember, rolling the trike forward and allowing the two front wheels to self center is a good way to find the perfect alignment point.

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Bottom Bracket and Derailleur

Figure 79 – Adjustable bottom bracket parts

It would be very difficult to guess the exact placement of the bottom bracket for your inseam (leg length) without making a small error. A fixed bottom bracket also means that you could never alter the seat, or adjust the StreetFox for anyone but yourself, so an adjustable bottom bracket is the only option.

If you cut the bottom bracket from an old bicycle frame, and leave a 12 inch or longer section of the seat tube connected (for the front derailleur), you can create a very functional adjustable bottom bracket with nothing more than a pair of steel plates. The bottom bracket and included seat tube will be mounted to the main boom with a clamp arrangement that allows the assembly to be placed practically anywhere on the boom to allow riders of varying heights to ride the bike. The two plates shown in Figure 79 along with the bottom bracket and seat tube stub will form the sides of the clamp

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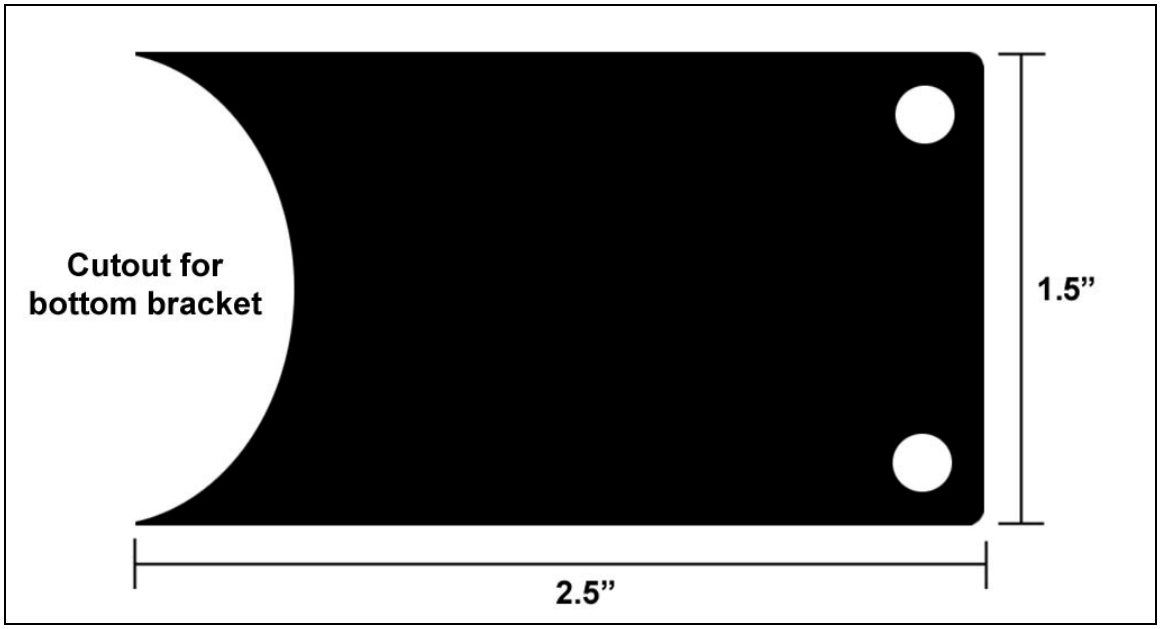
that will hold the bottom bracket against the side walls of the main boom as they are forced together by two bolts.



Drawing 6 – Adjustable bottom bracket clamp plates

The bottom bracket and front derailleur tube move together along the main boom, so you do not need to worry about the position of the derailleur over the chain ring. The chain is cut to the perfect length once the bottom bracket has been adjusted for the main rider, but will still allow a few inches of adjustment in either direction without a chain alteration due to the spring loaded rear derailleur. Of course, the difference between a 6 foot 5 inch versus a 4 foot tall person will likely require some chain adjustment, but this can be done in less than a minute with an inexpensive chain link tool.

Cut two 3/16 inch thick pieces of plate or sheet to make the shapes as shown in Drawing 6. The round area is cut to conform to whatever size bottom bracket you decided to go with, and the two bolt holes will be drilled for 3/8 inch bolts. The bolt holes are drilled at the edge of the plates so that there is 1/8 inch of material between the hole and edge of the plate. These two plates will form a "vice" that will clamp the bottom bracket to whatever position on the main boom you want.

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Figure 80 – The plates will conform to the bottom bracket

Trace around the bottom bracket shell to draw a line on the plates as shown earlier in Figure 79. The marker line should meet the corners of the plate to ensure that you don't cut out too much off of the plate when grinding out the rounded area. If you take too much metal away from the plate, there will not be enough room between the bottom bracket and the clamping bolts for the main boom.

When grinding out the traced circular area for the bottom bracket as shown in Figure 80, place both plates in the vice so they can be done at the same time; this will ensure that both plates are exactly the same size. Try to make the gap as small as possible around the bottom bracket shell so that there is less distortion as the plates are welded. If the bottom bracket becomes overly distorted, it will be a serious challenge trying to screw the hardware back into the bottom brackets without stripping the threads.

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Figure 81 – Clamping the plates for welding

In order to get the two plates aligned with each other and at the correct spacing, a bit of frame tubing can be clamped between the two plates as shown in Figure 81. This will allow you to set the bottom bracket into the correct position for tack welding, as well as ensure that both plates are aligned with each other so the bolt passes easily through both holes.

I also placed a sheet of paper (folded in half) between each plate and the side wall of the tubing in order to allow a little clearance between the clamp plates so that the unit is not so difficult to slide when making adjustments. Without the small gap, it is easy to scratch the paint if you plan to move the bottom bracket around a few times.

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Figure 82 – Proper front derailleur tube angle

As shown in Figure 82, I used an adjustable square set to the required 56 degrees in order to set up the bottom bracket and derailleur tube to place two small tack welds at the top of the joint. It may be a bit tricky to get the first tack weld in place while holding the bottom bracket in position, but once this is done, the rest is easy.

With the piece of frame tubing as a guide, you will automatically have the correct distance between the plates. Now, you will need to ensure that there is approximately equal distance between each plate and the edges of the bottom bracket. In other words, the bottom bracket will be in the center of the main boom as viewed from above.

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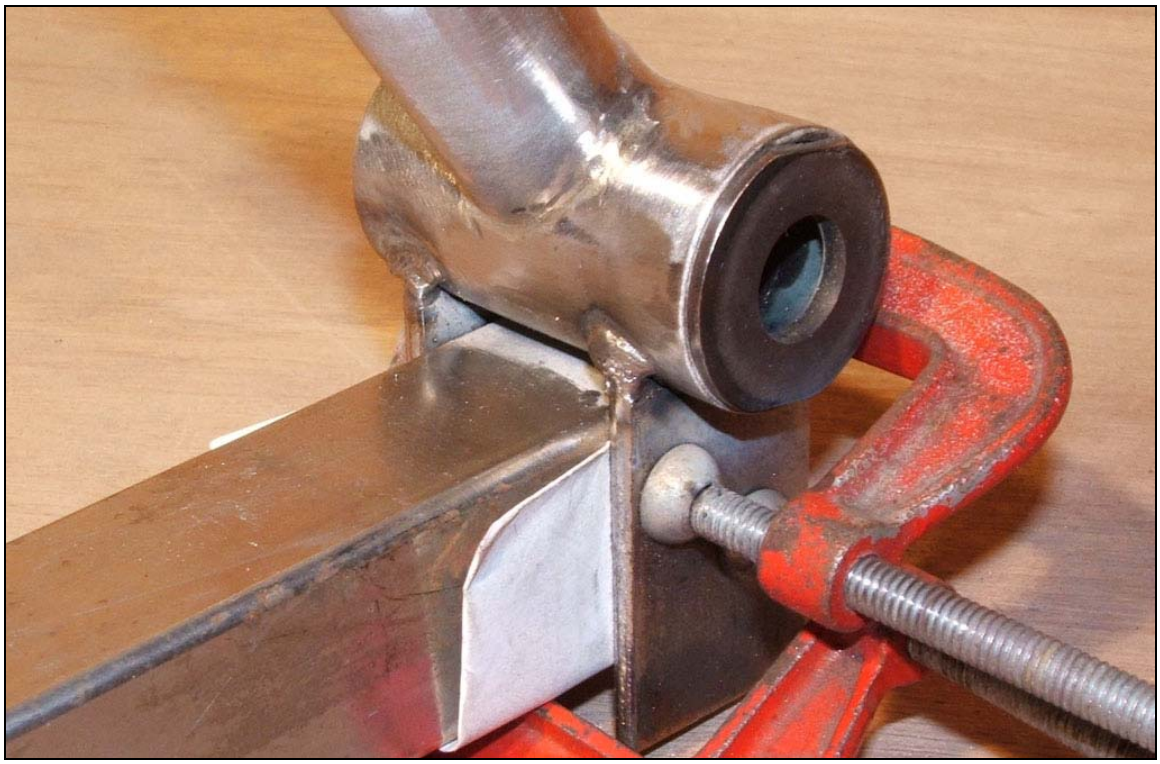

Figure 83 – Clamp plates tack welded to the bottom bracket

Figure 83 shows the first tack welds done at the top edge of the plates in order to secure the parts together. Ensure that the derailleur tube angle is close to 56 degrees and that the bottom bracket is at 90 degrees to the square tubing. You can also move the clamps to hold the plates in a position that will allow you to weld around the entire joint.

Also, welding is only done on the outside of the joint, not between the plates. If the inside of the joint is welded, the weld bead will not allow the bottom bracket to sit directly on the frame tubing and could cause alignment problems. Because of the way the clamp system works, there would be no added benefit from welding the inside of the joint anyway.

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Figure 84 – Marking a line for bolt hole drilling

The two plates will form a vice-like grip on the frame tubing when the 3/8 inch bolts are tightened. In order to drill the holes into the plate, draw a line that represents the bottom corner of the frame tubing as shown in Figure 84. Now you can punch and drill the holes using the line as a guide that will allow you to ensure that the holes stay below the line. If the holes are not below the line, you will not be able to pass the bolt through both plates because it will hit the frame tubing instead.

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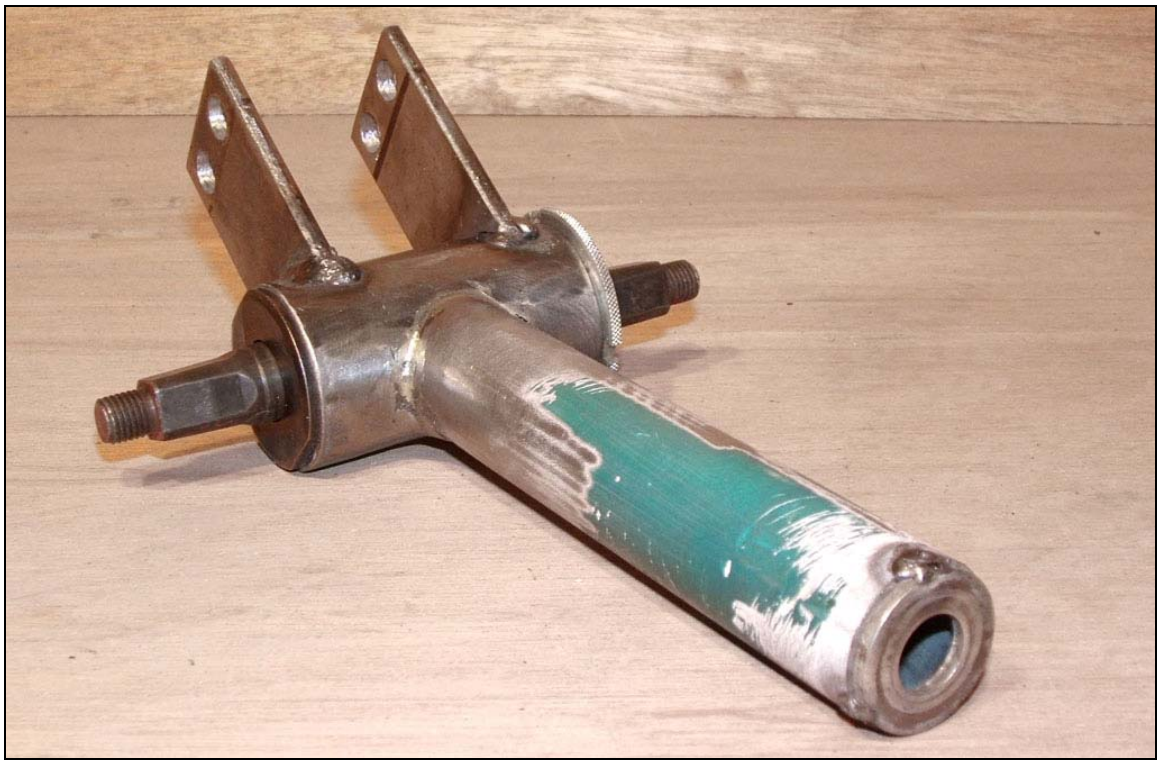

Figure 85 – Capping the end of the derailleur tube

With the derailleur tubing cut to length, it is a good idea to cap off the open end of the tubing so that it looks better and keeps any moisture out. As shown in Figure 85, a washer is welded over the end of the tube and then completely filled in around the joint and the hole. To fill in the washer hole, several passes are made around the edge until completely covered in weld metal.

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Figure 86 – Completed adjustable bottom bracket

After welding the washer in place and grinding the area clean, you can't even tell the tube shown in Figure 86 once had an open end. Going the extra mile can make your final product look very professional, possible even better than some mass produced machines, since they might have simply capped the hole with a plastic plug to save time.

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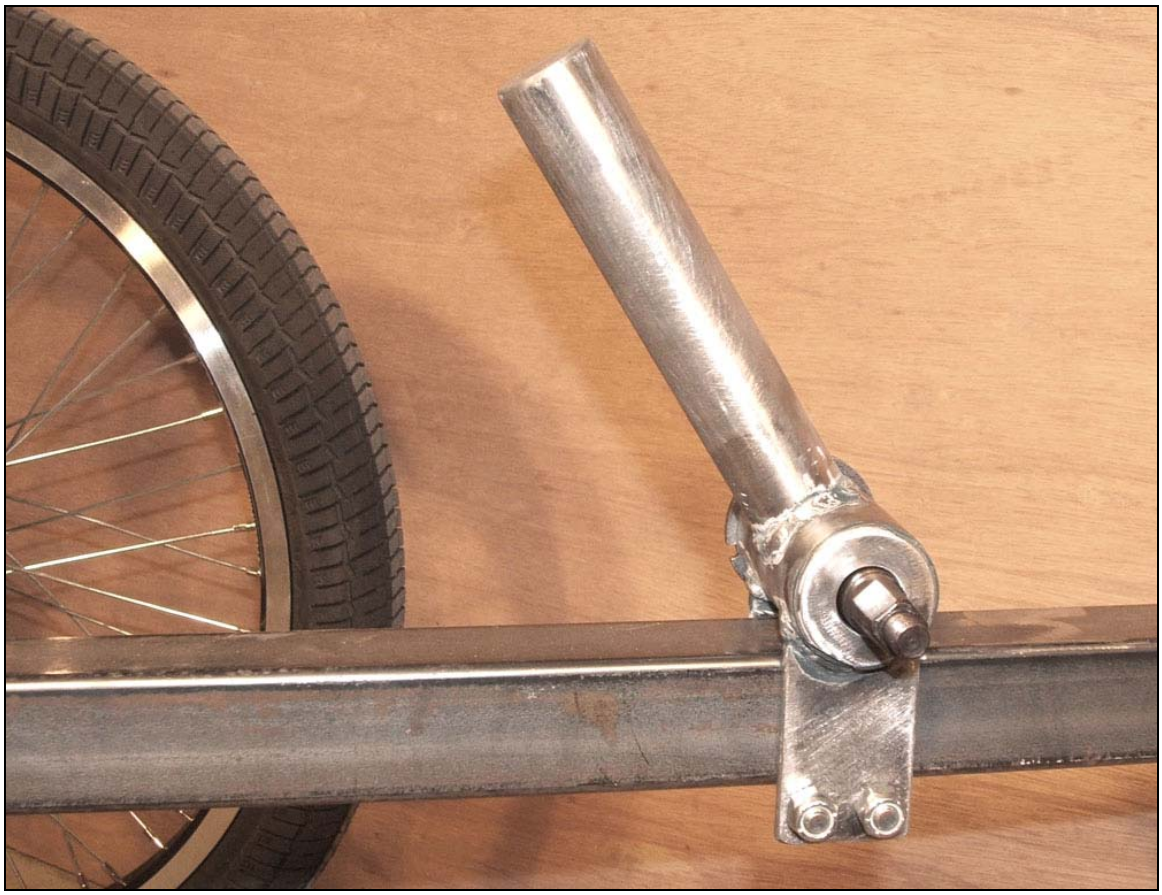

Figure 87 – Adjustable bottom bracket installed

Figure 87 shows the sliding bottom bracket secured to the frame. Notice that the bolts are fairly close to the underside of the frame tubing thanks to the guide lines used to drill the holes. The derailleur tube is very close to the 56 degree angle as well. Tighten the bolts enough so that you can't force the bottom bracket to move by pulling on the derailleur tube, but not too tight, or you may actually crush the frame tubing. Don't bother greasing up the bottom bracket bearings just yet, as you will want to do that after the priming and painting is completed.

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Pulleys and Chains

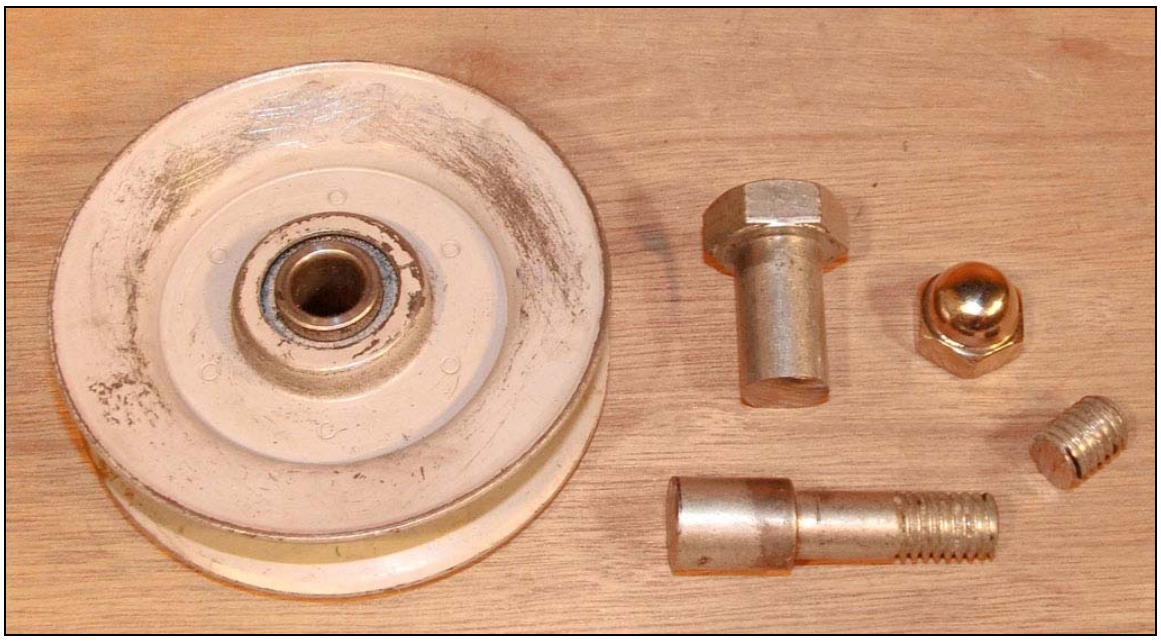

Figure 88 – A V-belt idler pulley for use as a chain guide

You are almost ready to cut the proper length of chain and connect your transmission system. The obvious problem right now is the fact that the chain will rub on the underside of the right front arm tube, so an idler pulley needs to be installed in order to guide the chain under the tubing. Almost all tadpole trikes have at least one drive side idler pulley, and this is unavoidable due to the low seat height and position of the front chain ring. Fewer chain idlers and less of a bend in the chain is always better, since idlers and sharp chain bends cause extra friction in your drive line, robbing you of your top speed. The StreetFox has only a single idler and it only bends the chain slightly, so the transmission is very efficient. Figure 88 shows the V-belt idler pulley that is used to guide the chain - it is a commonly available 3 inch diameter 1/2 V-belt idler pulley with a 3/8 ball bearing mounted in the center.

You can find these pulleys at any lawn and garden supply center and many hardware stores. A hard nylon V-belt pulley will also work, but make sure the bearing in the center is a good ball bearing not some cheap brass bushing as that will add massive friction. The cut up shoulder bolt also shown in Figure 88 is a lawn-mower wheel mounting bolt, which just happens to fit the 3/8 bearing hole in my idler pulley. Any decent quality

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bolt will work for this, as the goal is to mount the pulley about one inch off the side of the main boom.

Some trike builders have used skate blade or skate board wheels with the center ground out to take the chain, but I would avoid that system as it causes extra friction due to the softness of the wheel material, and the diameter of the pulley should not be less than 3 inches when installed on the drive side of the chain. The skate wheels system also allows the chain to jump out of the track easily, forcing you to add some type of chain stopping plate, so it really is not worth the hassle just to avoid spending $5 on a good quality V-belt idler pulley.

Figure 89 – Idler pulley bolt installed

The chain idler pulley is mounted to the right side of the main boom just behind the right front arm tube as shown in Figure 89. Hold the pulley against the frame so you can determine the best place to install the idler pulley bolt. When you are done, the pulley should be as close to the arm tube as possible without rubbing, and the pulley should stand off from the frame about 1 inch, which is why the lawn-mower wheel shoulder bolt worked

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perfectly for this job. A bolt and a few nuts could also be used if you can't find a decent shoulder bolt like I did.

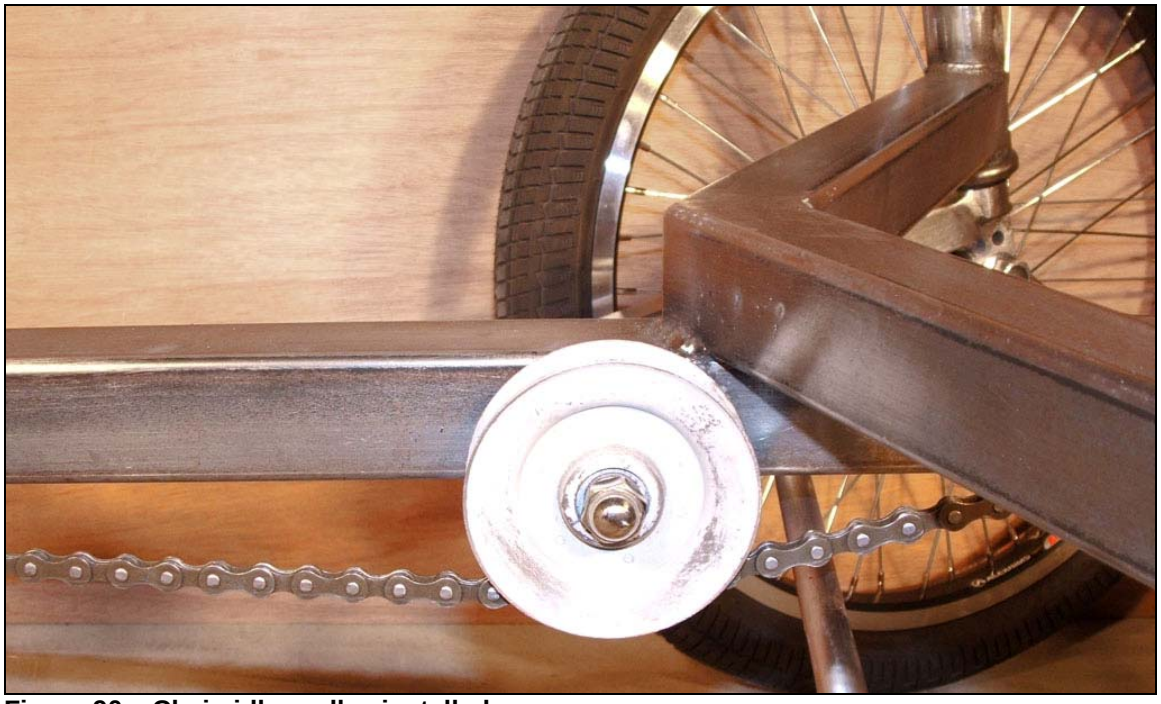

Figure 90 – Chain idler pulley installed

Figure 90 shows the chain idler pulley guiding the drive side of the chain around the right front arm tube at a very slight angle. At this point, you can install your front cranks, rear derailleur, and fiddle around with your chain tool until you get the chain cut to the correct length. A chain link tool can be purchased from any bicycle shop for about $20, and will save you countless bangs on the thumb if you try to break and connect a chain using a punch and hammer. You will probably need two full bicycle chains, and possibly a small part of a third chain to make the trike chain, so try to ensure that all chain segments are the same size and type. Bicycle chains are not expensive, so it might be best to work with new materials here.

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Seating

Figure 91 – Seat mounting tabs

Seating is a personal choice, and since the StreetFox has such a simple frame, you can install just about any type of seat you would like, from a simple board seat to a height tech adjustable mesh and frame style seat. I prefer the simple board and pad seat over mesh seating, so I will show you how to fashion a comfortable and simple seat using some plywood, foam and fabric. To use a board style seat, you will need to bolt it directly to the frame, but since drilling holes into the main boom is a bad idea, a few seat mounting tabs like the ones shown in Figure 91 need to be made. Four lengths of 2 inch long 1/16 inch thick flat bar have been cut and will be welded to the main boom to hold down the two plywood seat boards.

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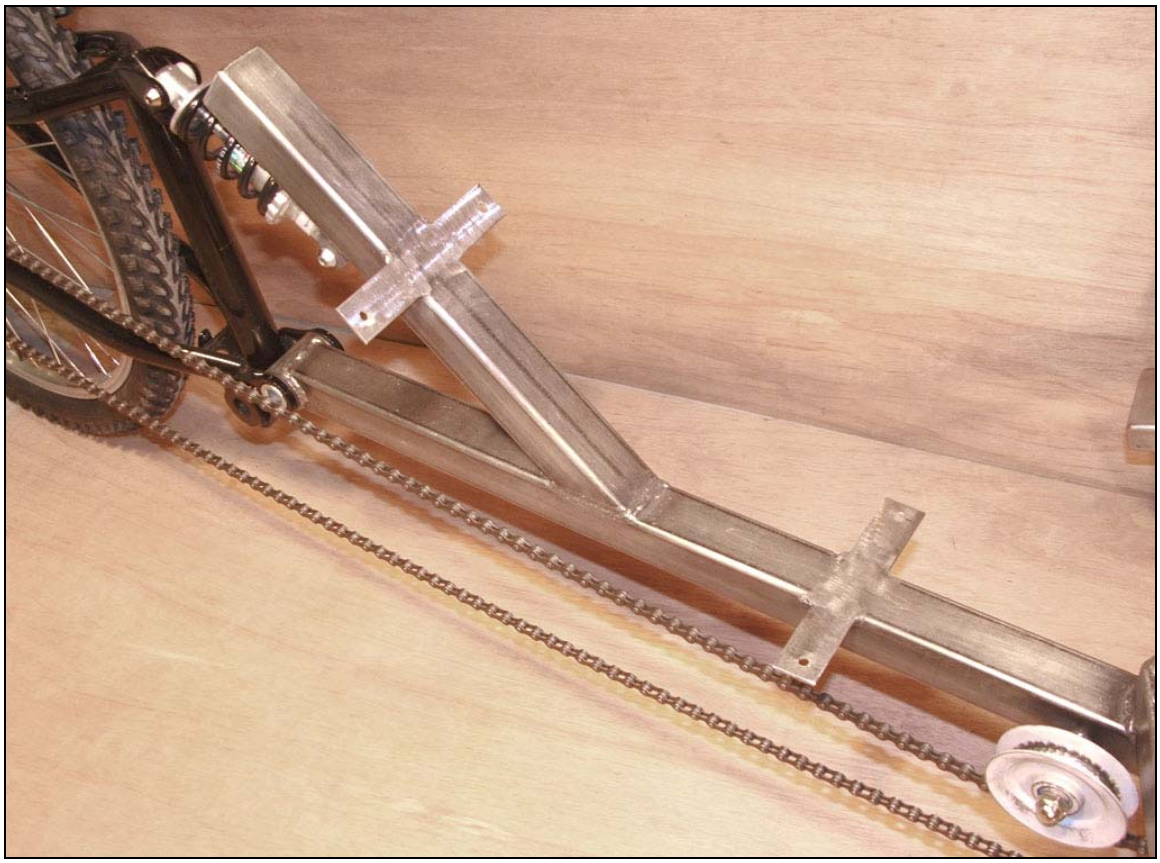

Figure 92 – Installing seat mounting tabs

The two piece plywood seat has a base and a back, which are bolted to the seat mounting tabs. The tabs have been welded to the main boom and seat tube as shown in Figure 92. The tabs are flush with the top of the square tubing, and the welds are ground flush as well. You can now mount any type of plywood seat, or even a fishing boat seat to the frame. Later, I will show you how I made my minimal, yet comfortable wood and foam seat.

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Handlebars

Figure 93 – A pair of steel goosenecks

The steering system is now complete, but you have no place to hang on, so the handlebars need to be created so you can get out and test ride your new trike. Handlebars are another piece of hardware that can by modified to suit your own style, so feel free to experiment with angle, size and shape using the basic design shown here.

No matter how you decide to fashion your handlebars, you will need two gooseneck stems that can fit into the fork stems installed on your trike. Figure 93 shows the two standard steel bicycle goosenecks I have decided to cut up to make my handlebars. Do not worry about the condition of the gooseneck clamp, as this simple handlebar design only requires the stem.

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Figure 94 – Gooseneck stems and a bicycle handlebar

Trim the clamp and the neck away from both goosenecks, leaving nothing but two equal length gooseneck stems and the mounting hardware as shown in Figure 94. You can now find a set of bicycle handlebars to cut in half and weld directly to the gooseneck stems in order to create your handle bars. It make take some experimenting to find the most comfortable angle and length, but a good place to start is with a pair of these common "Granny bike" handle bars as shown in Figure 94.

Figure 95 – Handlebars cut into two equal pieces

The handlebars need to be cut into two equal pieces to form a left and right handlebar for your trike. As shown in Figure 95, the handlebars are cut

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in half, then ground out to mate with the gooseneck stems at a position that feels comfortable and allows a full range of motion and easy reach of the brake levers. Most likely, this optimal position will take some experimentation to get right, so its a good idea to have your seat installed, or at least a few boards so you can sit on the trike and get a feel for where your hands feel most comfortable.

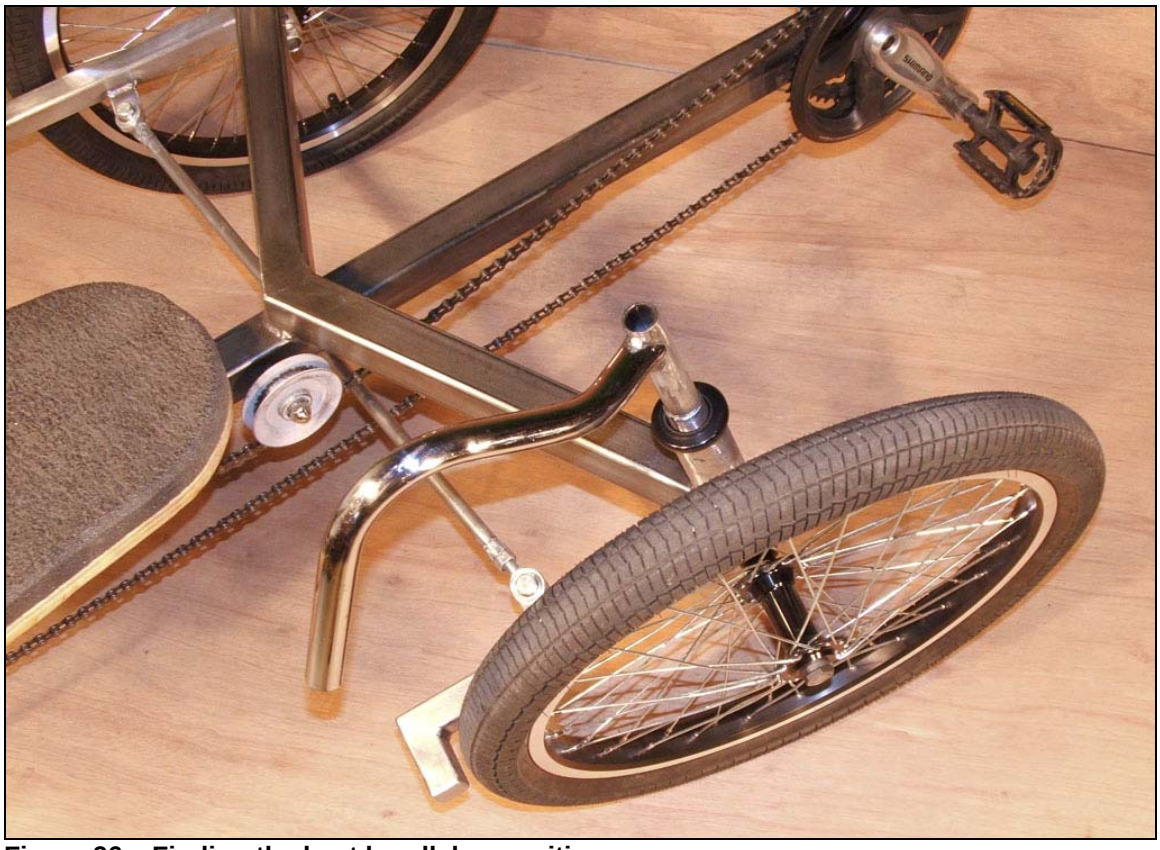

Figure 96 – Finding the best handlebar position

With your seat, or a few boards installed on the frame, test your handlebars by only tack welding them to the gooseneck stems at first, so that you can make sure you like the position and angle of the bars. I found that having my hands just slightly inside the edge of the front wheels at the position shown in Figure 96 seemed just right. Close your eyes and let your hands find the most natural position, as this is probably the position that best suits you.

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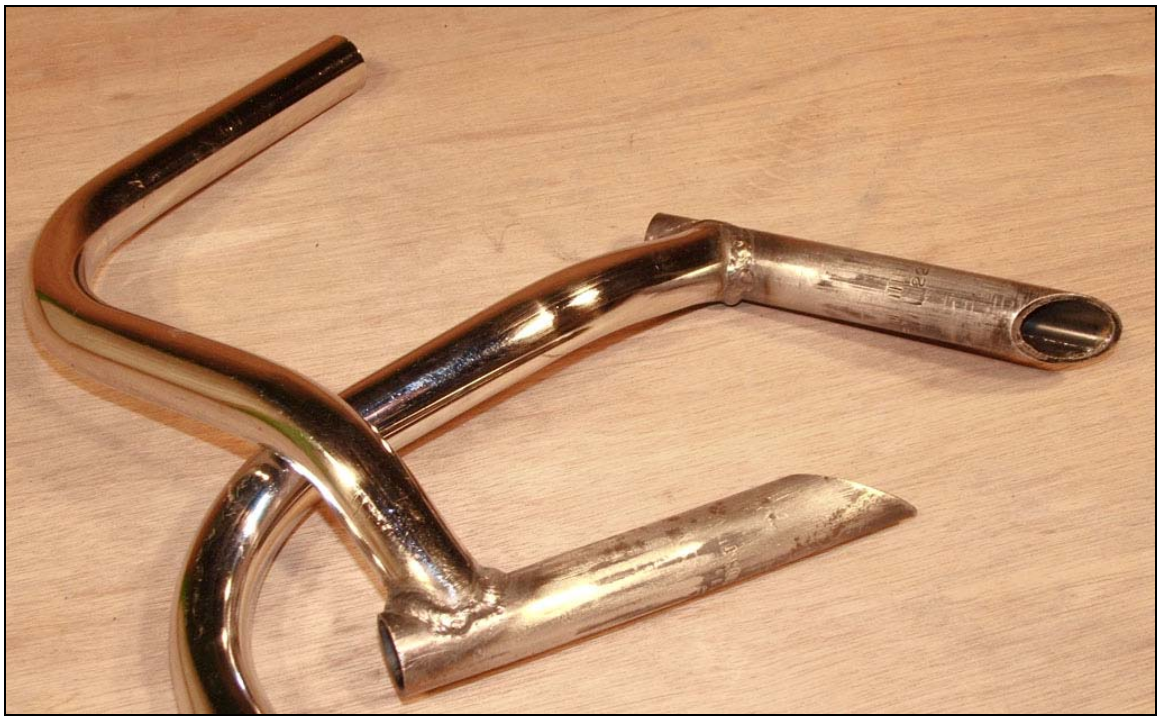

Figure 97 – Handlebar halves completed

When you do find that perfect handlebar position and angle, weld one of the handlebar halves with a few more solid tack welds and then install it back on the trike for one final test. If the handlebar seems good, fully weld the joint and then do the same to the other half, trying to make it exactly the same as the first. Remember, there is a right and left side, so you can simply mirror the fishmouth cut from one bar to the other. Figure 97 shows the two handlebar halves after completely welding around all the joints and checking the weld for errors.

Adjustable Backrest

Figure 98 – Adjustable back rest parts

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If you choose to make a simple wood and foam seat like I did, you may also want to make an adjustable back rest as well. This is of course optional, and you could simply choose to make your seat back a lot taller instead. The seat is most comfortable if it supports the upper part of our back so that you do not have to hold your head forward while riding.

You should complete the main seat before committing to a back rest in case you find that it was really not needed. Another thing to avoid is a head read rest, as any road vibration will be fed directly to the back of your head, making travel on all but the most perfect pavement really uncomfortable. Using some leftover mountain bike handlebar tubing and a pair of those knuckle protectors (Figure 98), I came up with a simple yet functional adjustable back rest system.

Figure 99 – Back rest tube and clamp

I knew where the back rest needed to be placed by simply sitting on my seat, then I cut the old mountain bicycle handlebar tubing to the correct length then welded it a section of one of those knuckle protector things I had in my scrap pile. Figure 99 shows the resulting assembly, which looks like some type of long bizarre gooseneck.

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Figure 100 – Back rest mounting tabs installed

The back rest will be made just like the rest of the seat, so a pair of seat mounting tabs are added to the back rest support tube, just like they were added to the main frame earlier (Figure 100).

Figure 101 – Adjustable back rest installed

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To allow the back rest to adjust for comfort, a small section of the handlebar tubing was welded to the top side of the seat boom tube as shown in Figure 101. Now the clamp can be tightened to hold the back rest tube at whatever angle feels best. Plastic handlebar plugs have been used to cap off the ends of the tubing, since they fit perfectly.

Return Chain Idler

Figure 102 – An old rear derailleur for hacking

Yes, you are almost ready for a test ride! You may have noticed that the return chain (non-drive side) is hanging pretty low to the ground, and can easily flop around, bouncing off of the rear wheel. Sure, you can leave it like that, but there is nothing uglier than a flopping return chain to ruin the nice lines of your trike.

A hanging return chain makes your vehicle look unfinished and will let dirt collect in the chain as flops close to the ground. To keep the chain under control, all you need is a small idler wheel made from just about any lightweight pulley, skate board wheel, or even an old rear derailleur, like the

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one shown in Figure 102. There is absolutely no stress or tension on the return chain, so you do not have to use a ball bearing pulley, or worry about the diameter. Even a bit of garden hose can do the trick.

Figure 103 – Reducing the derailleur to the minimal parts

Figure 103 shows what is left after removing most of the derailleur parts - a perfect idler system, ready to be welded directly to the main boom. The only goal here is to pick up the slack chain so it does not flop around or hit the ground when you are hitting the trails on our trike.

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Figure 104 – Return chain idler installed

By welding the derailleur part to the rear of the main boom as shown in Figure 104, the problem of an ugly, flopping chain has been solved. A bit of garden hose, skate board wheel with a slot cut, or even another V-belt pulley would also do this job, so dig through your junk pile for ideas if you do not have an old derailleur to butcher.

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Front Brakes

Figure 105 – Front brake installation

By drilling a hole in the brake support arms, you can simply drop in a pair of stand bicycle caliper brakes for your front wheels as shown in Figure 105. The hole should be directly in line with the center of the tire so both brake pads hit the rim at the same position. The only down side to this system is that one cable is on the inside of the trike and the other will be on the outside. This will not cause any problems, but being a symmetry freak, I wish I could avoid this.

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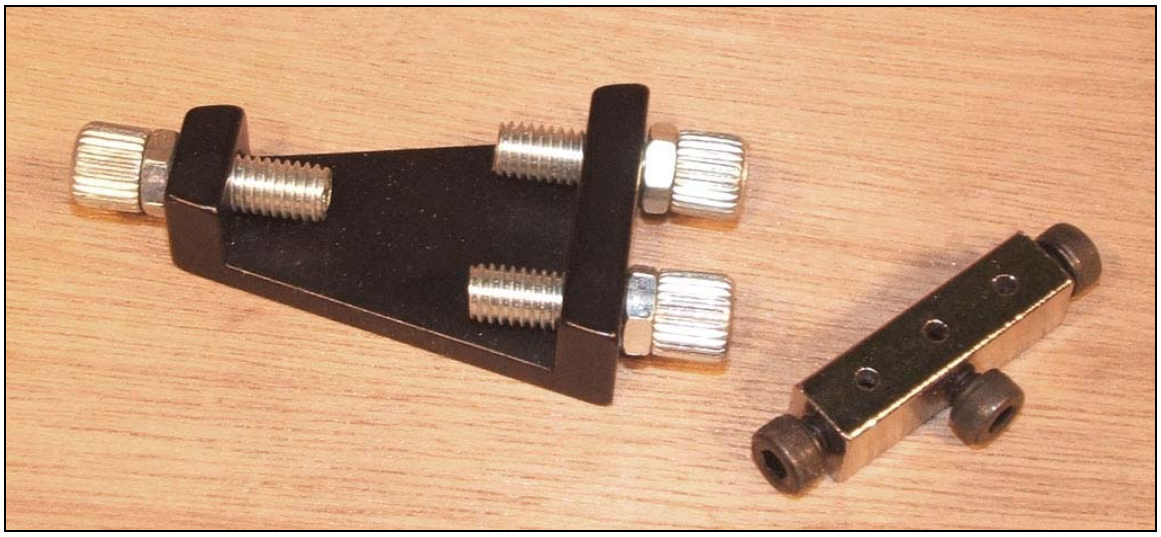

Figure 106 – A “one into two” cable adapter

Now your trike has three brakes, which will require three cables. The problem is that you only have two hands, and therefore will only have two brake levers. Obviously, one lever will have to pull both front brakes, and there are three solutions that I know of to solve this puzzle. The cable doubler shown in Figure 106 is the worst option, but it is also the cheapest. This little adapter lets you pull two cables with one cable by clamping them into the small metal block shown in the right of the Photo. The device does work, but it is ugly and adds a lot of friction to your braking system, so you need to apply a lot of force to get the front wheel rakes to engage. Most bicycle shops can sell you an adapter like this, as they are used on older freestyle BMX bikes to help with something called a "gyro".

A better option is a ready made cable that looks like one cable into a small housing with two cables coming out. Again, this is a common BMX part that most bicycle shops will know where to get. The best option, which is the one most used on tadpole trikes, is a brake lever that is already set up to take two cables. You might have to search the Internet for "dual brake lever", but there are several companies that make them. With a dual brake lever, you can go about your cabling as if you were cabling a standard bicycle.

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Basic Seat Design

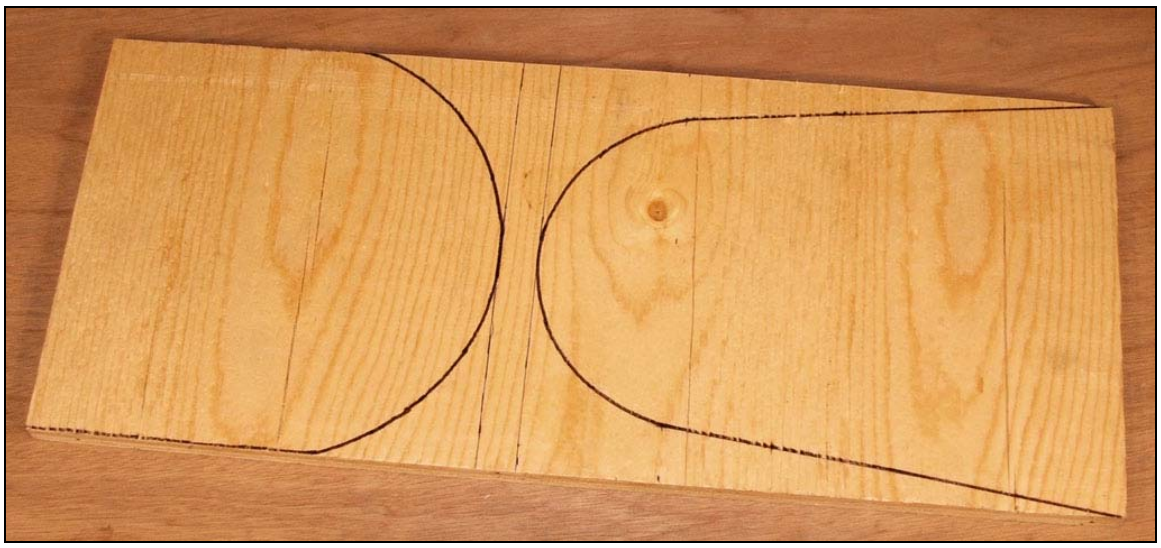

Figure 107 – Cutting out a wood seat base

I like a minimal seat on most of my vehicles, so the plywood, foam, and fabric system seems to be my first choice. You should really consider your seating wisely, as everyone has a different opinion of what is comfortable, and my system may not be the best for you. My seat is 10 inches wide, with a base length of 10 inches, and a back height of 18 inches. The two parts shown in figure 107 are shown being cut from some 3/8 inch thick plywood. The rounded front and top were drawn by tracing a dinner plate and a bucket lid.

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Figure 108 – Clamps to joint the seat boards together

To join the seat base to the seat back, I cut out a pair 3 inch long pieces of 1/16 inch thick angle iron, and then hammered them out to the angle of the seat. Figure 108 shows the two angle iron pieces with woodscrew holes drilled into them.

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Figure 109 – Gluing the seat padding to the wood

Seat foam material should be comfortable to sit on, but not so soft that it does nothing for you. Brown sponge foam is useless, and hard Styrofoam is no better than bare wood. For my seat, I used some quality 1 inch thick seat foam for the back of the seat, and some scrap 2 inch thick packing material foam for the base. Both pieces of foam were glued to the wood using adhesive spray (Figure 109), and then trimmed along the wood using the angle grinder. Also keep in mind that the thicker the base foam, the taller your backrest will need to be in order to support your back at the required height.

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Figure 110 – Ready for seat covering

As shown in Figure 110, the angle grinder makes nice work of trimming the edge of the foam around the edge of the wood. Be careful when grinding foam with your grinder though, as the foam ends to grab the disc if you try to take off to much at once or don't hold the seat securely when doing the work.

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Figure 111 – Getting ready to stretch and staple

Seat padding is simply cut to fit, then stretched over the foam to be stapled on the back of the seat. A real seat is sewn together as a top cover with sides, but this "poor man's" upholstery system works equally as well and takes very little time. I am not big on cutting corners, but if you ride a lot, the seat material will wear out after a year anyhow, so why get too fancy? Figure 111 shows the beginning of the staple intensive journey.

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Figure 112 – Don't be chinsy on the staples

If you stretch the material as you add each staple, you can probably get most of the wrinkles out of the material. A thicker material will be more difficult to work with, but the results can be decent if you take your time. Figure 112 shows how many staples keep the material stretched around the corners to reduce the wrinkles.

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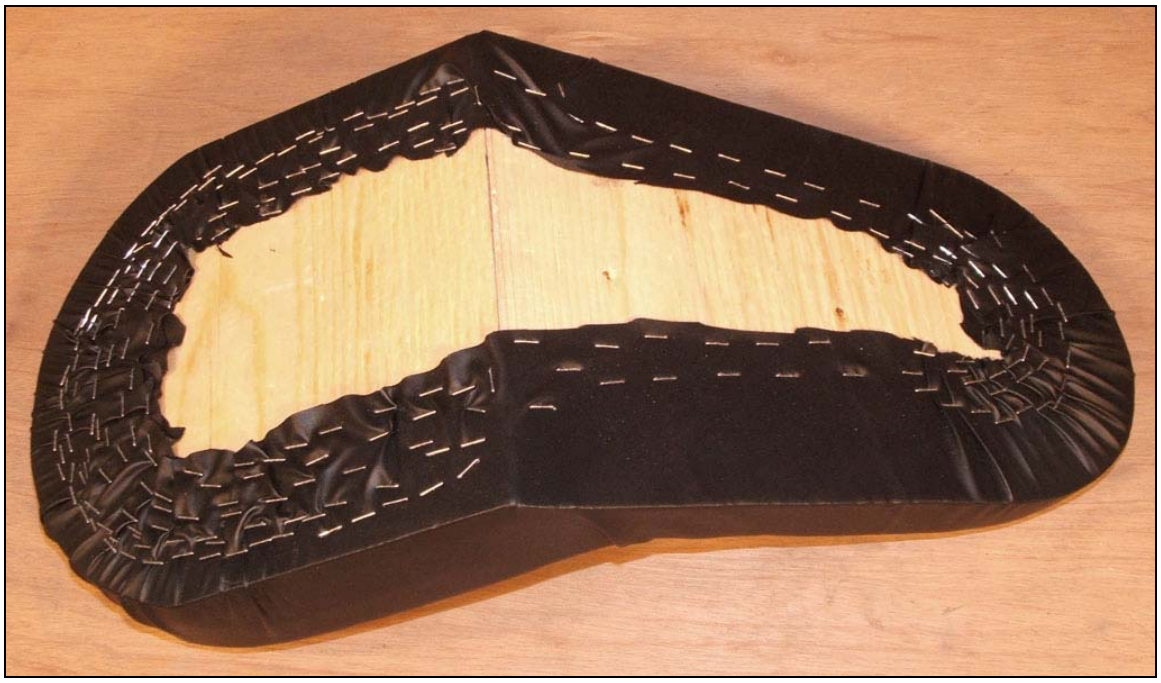

Figure 113- Good thing staples are inexpensive!

After you fight with the material and empty your staple gun like you were fighting a war with it, your material will likely be wrapped tightly around the seat to look like the seat shown in Figure 113. To cover up the back of the seat, another piece of material can be cut to the shape of the seat back and then stapled around its edges. Plastic or very thin sheet metal can also be used to hide the ugly staples and bare wood.

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Figure 114 – A strap hides an imperfect seam

Because the seat was covered with one continuous piece of material, the seam at the center was not perfect, so I stretched a length of seat belt material around the seam and stapled it to the wood. Figure 114 shows the completed seat, which is not perfect, but not all that bad either.

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Figure 115 – Completed back rest pad

The back rest is made exactly like the rest of the seat (Figure 115), and then covered with a piece of sheet metal to hide the wood and staples. I decided to use metal rather than more staples and material to finish up the back rest because it would be much more visible on the trike, so it should look professional.

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Trim Excess Main Boom and Paint

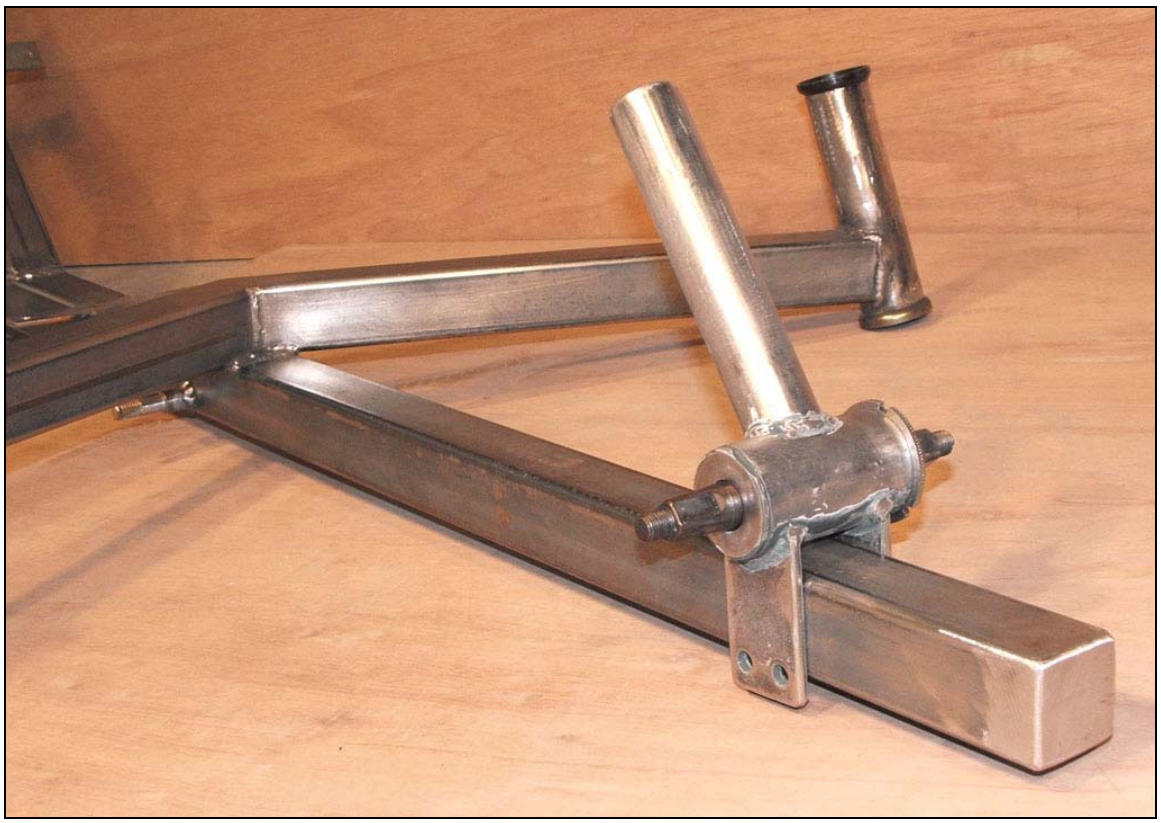

Figure 116 – Trimming the excess boom length

The last thing that needs to be done is the trimming of the excess main boom length. With your seat and cranks installed, have the tallest rider sit on the trike (wearing shoes) and set up the adjustable bottom bracket to the correct place on the main boom. Now mark the boom, leaving a few extra inches and cut away any extra length that will not be necessary. If you plan to add a fairing or body later on, you may consider leaving the boom extra long. Of course, you have to cap off the open end of the boom tube just like you did with the seat tube, so it looks clean and solid as shown n Figure 116.

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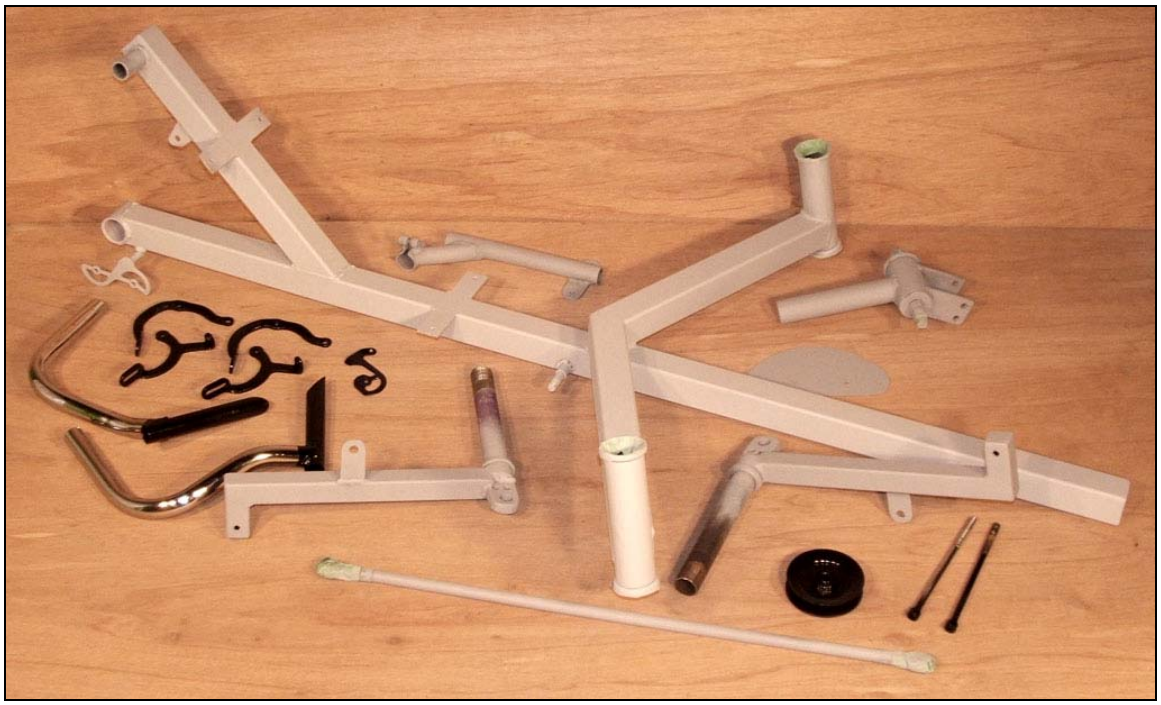

Figure 117 – Watching the primer dry

Waiting for paint and primer to dry is a painful experience, but don't lose patience and try to get your trike on the road before the paint or primer has cured. Often, primer needs a full day to dry, and paint will not be ready for handling for at least two days. If you read deep into the application directions, you might even see that proper paint curing time is a week or more, so the paint will be easily scratched of you are not careful. I always use department store spray cans, and usually the results are very good if I can avoid the urge to assemble a wet paint frame. Figure 117 shows the frame freshly primed with the smaller parts painted and curing.

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Final Adjustments and First Ride

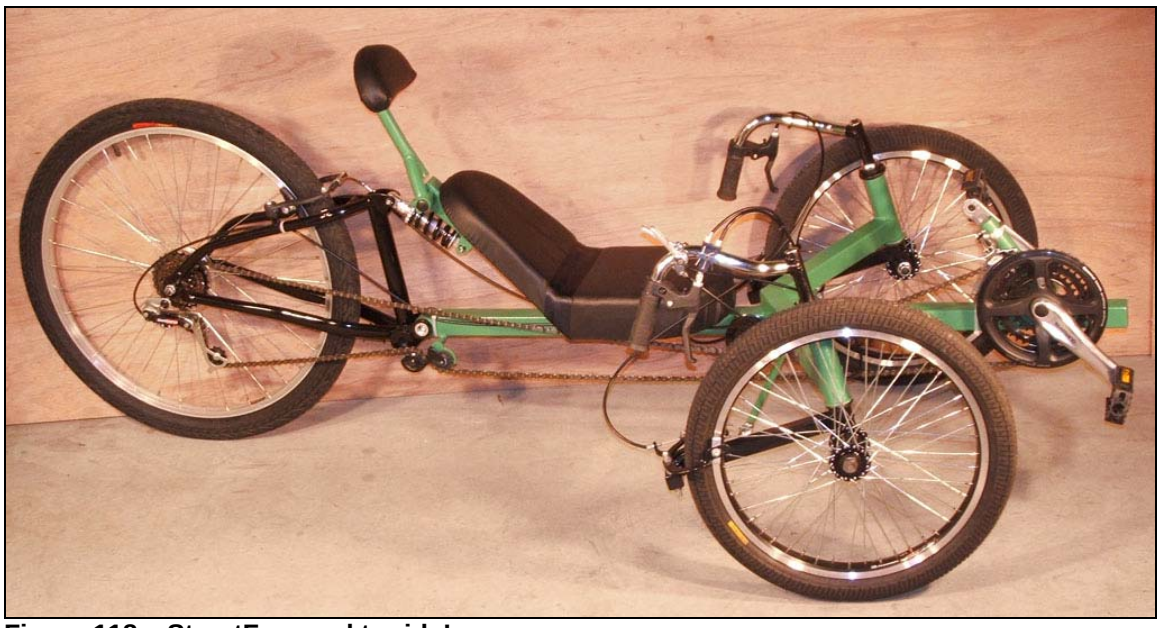

Figure 118 – StreetFox read to ride!

After two days of paint curing, I hit the garage and eagerly assembled the entire StreetFox in about two hours. All bearings were cleaned and greased, and new handle grips, tires, cables, and chain were installed. The completed bike shown in Figure 118 really looked like a factory job, and it and it handled as well as it looked!

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Figure 119 – Cable routing is an art

A cycle with three brakes, two levers, and two shifters has a lot of cable routing and planning that needs to be done. I really don't enjoy running cables all over the place, but this is a necessary evil that has to be done, so take your time and plan ahead before cutting any cable to length or adding any zip ties. Avoid any sharp bends in any cable, make sure the wheels can turn from side to side without putting a cable under great tension, and always replace any rusty, frayed or stiff cables with new ones. Figure 119 shows the plethora of cables running from the handlebars as well as the low budget “one into two” brake cable adapter.

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Figure 120 – Adjusting the derailleurs

Both derailleurs will need to be set up properly by adjusting the high and low limit screws so the chain does not travel past the largest or smallest chain ring when shifting. Adjust the limit screws before the cables are installed by simply moving the derailleurs by hand to set the minimum and maximum travel distances. Figure 120 shows the front derailleur being set up before the cables are installed.

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Figure 121 – Adjusting the rear brake

The brakes need to be fine tuned so that they don't rub when not in use, but at the same time grip the rim with optimal power when the lever is fully engaged. Each brake lever has an adjustment screw, and it should be screwed all the way in when you initially set up the brakes. If the brakes don't grab hard enough, slowly turn the lever adjustment screw counter clockwise to stiffen up the brakes. A tiny bit of brake rubbing is OK as long as you can spin the wheel freely. Figure 121 shows the rear of the StreetFox, with the rear brake cable fully installed.

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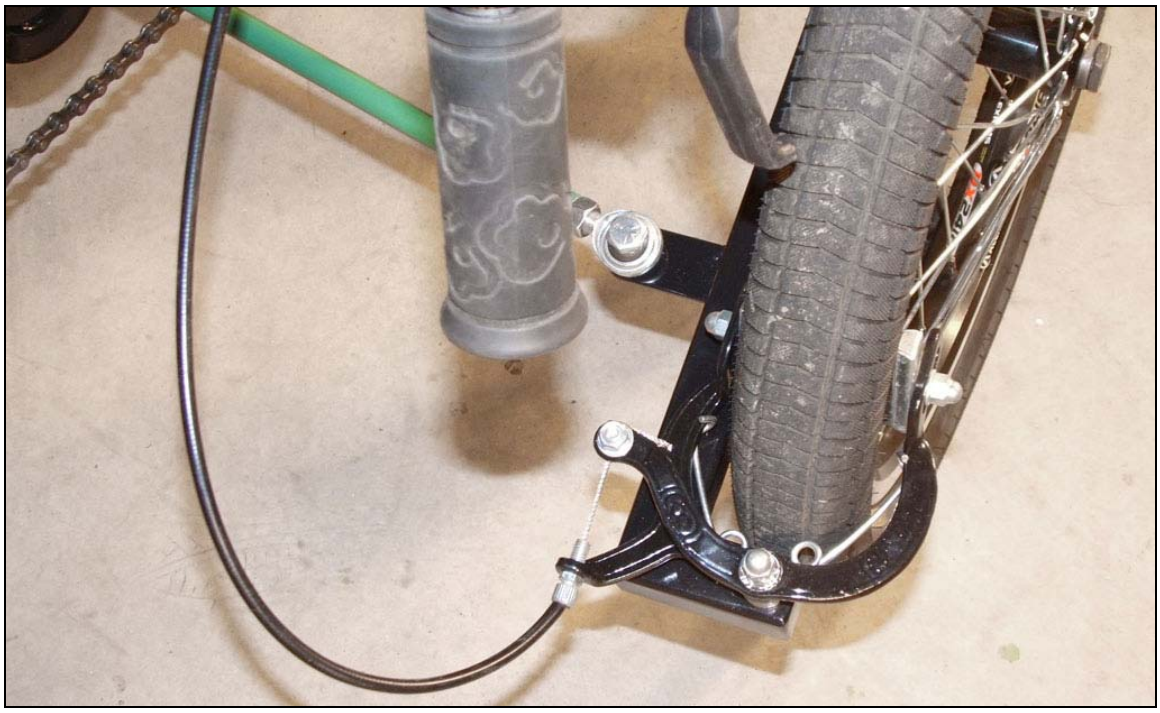

Figure 122 – Front brakes adjustment

Setting up the front brakes is done in the same way as it was done for the rear brake. There is an adjustment screw on the actual brake body, just like the one on the brake lever, so both should be screwed fully clockwise when first setting up the cables. Figure 122 shows a close-up of the front brake and the adjustment screw.

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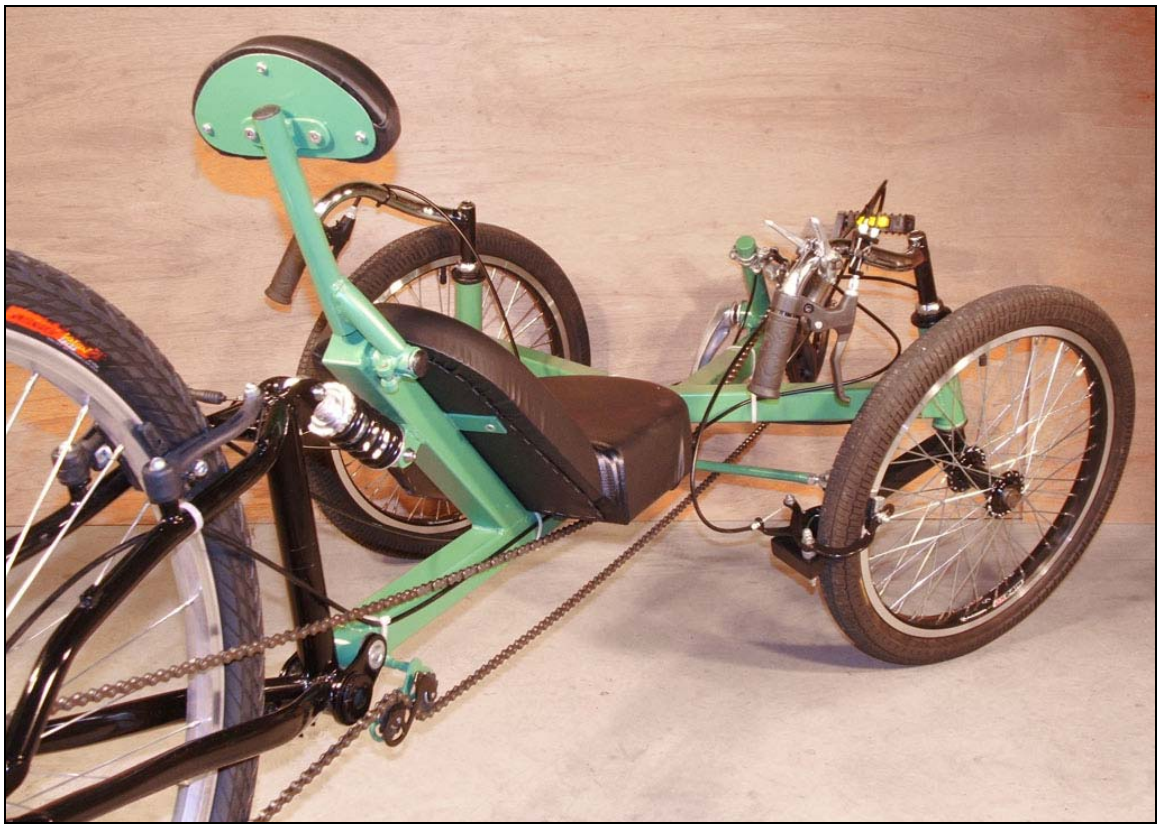

Figure 123 - It's time for the initial test ride

Go over all of the cables one last time, making sure that you can turn the handlebars at least 45 degrees in each direction without having a cable under tension or without having the front wheels rub on any cable. Also check the chain line, ensuring that no cable is rubbing on the chain, or any moving part. You can jack up the rear and test the shifting, or simply hit the road to see if everything is working the way it should. It's also a good idea to always check the front axle bolts before any ride, in case they have worked loose from excessive vibration. Figure 123 shows the completed StreetFox Trike, calling out for its pilot to jump into the driver's seat.

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Figure 124 – StreetFox posing for the camera

Figure 124 shows what can be done with a little hard work and some commonly available bicycle parts. The StreetFox looks and rides as good as any commercially available trike, yet cost less than the shipping charge on a factory unit. Speed and braking are very good, and steering is comfortable and stable at any speed. Hill climbing is not a problem due to the full range of gearing, and the suspension makes for a very smooth ride. Most people who encounter the StreetFox think it was store bought, and give a strange look when told it was made using hand tools from typical bicycle parts.

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Showing Off Your New Wheels!

Figure 125 – Kat's new wheels!

Kathy (Koolkat) hits the trails on her new StreetFox, taking on pavement, steep hills, gravel roads, and bush trails without any problems at all. Riding a comfortable recumbent trike is so much easier on your body than an upright bicycle, so the long journeys are truly enjoyable. The wonderful scenery shown in Photo 125 is Kakabeka Falls, near our home base in Ontario, Canada.

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Figure 126 – Enjoying the scenery on a comfortable trike

Because you can ride in the most comfortable seated position with never a need to put your feet down, a recumbent trike is like your favorite living room chair and the entire world is your television set. Often we ride our recumbent trikes to the beach or somewhere to have a picnic, and we never have to bring chairs along! Figure 126 is another shot of KoolKat enjoying the scenery at the Kakabeka Falls campground, with the Kam River in the background.

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Figure 127 – The StreetFox Tadpole Trike

We hope you enjoy building and riding your recumbent trike as much as we have! The results of your hard work will certainly be worth it, and nothing can compare to the feeling of riding your own quality built recumbent trike. I hope to see your work or progress in the Atomic Zombie forum, and would certainly be happy to post a photo of your completed trike in our gallery for other builders to see. Thanks for your support, and happy riding!

Once again, thanks for our support, and good luck on all of your projects!

Brad Graham and Kathy McGowan
Atomic Zombie™ Extreme Machines

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